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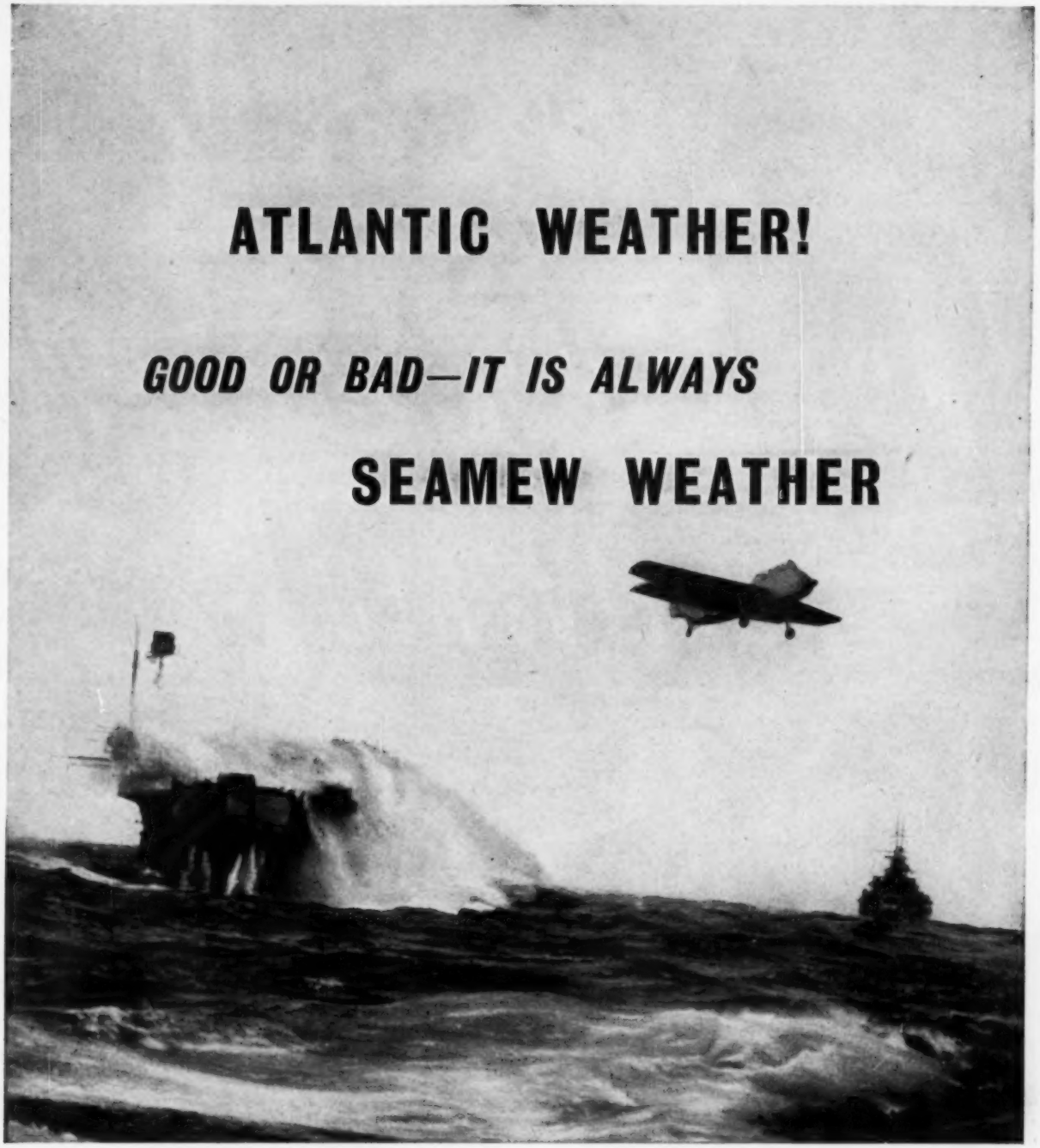

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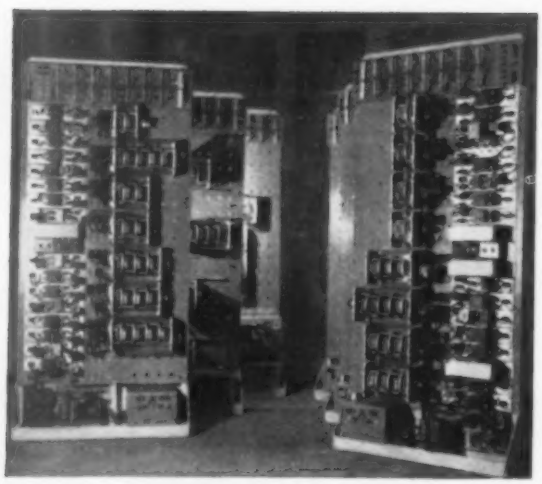

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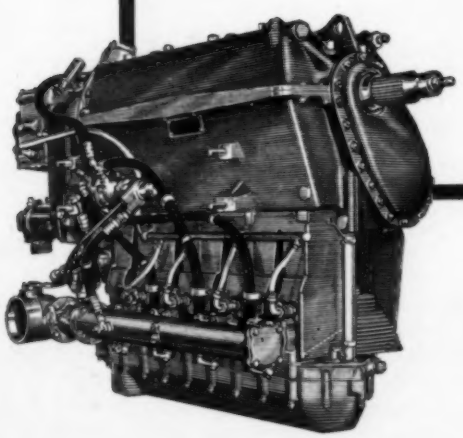

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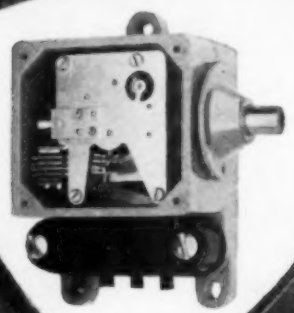

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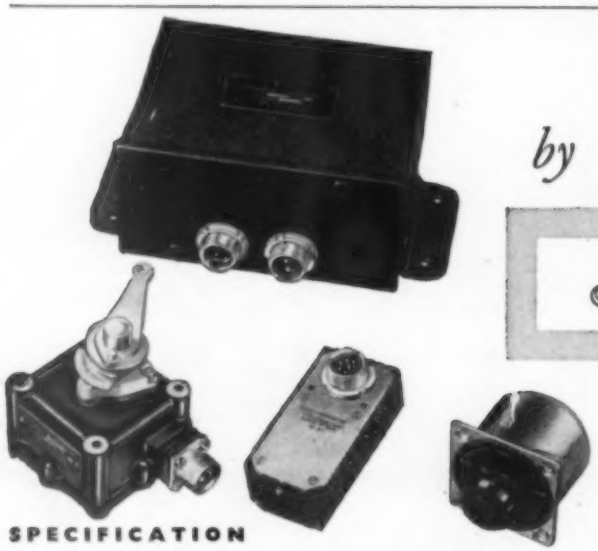

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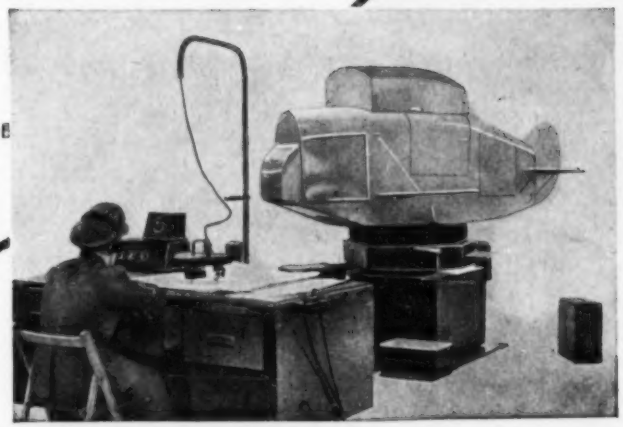

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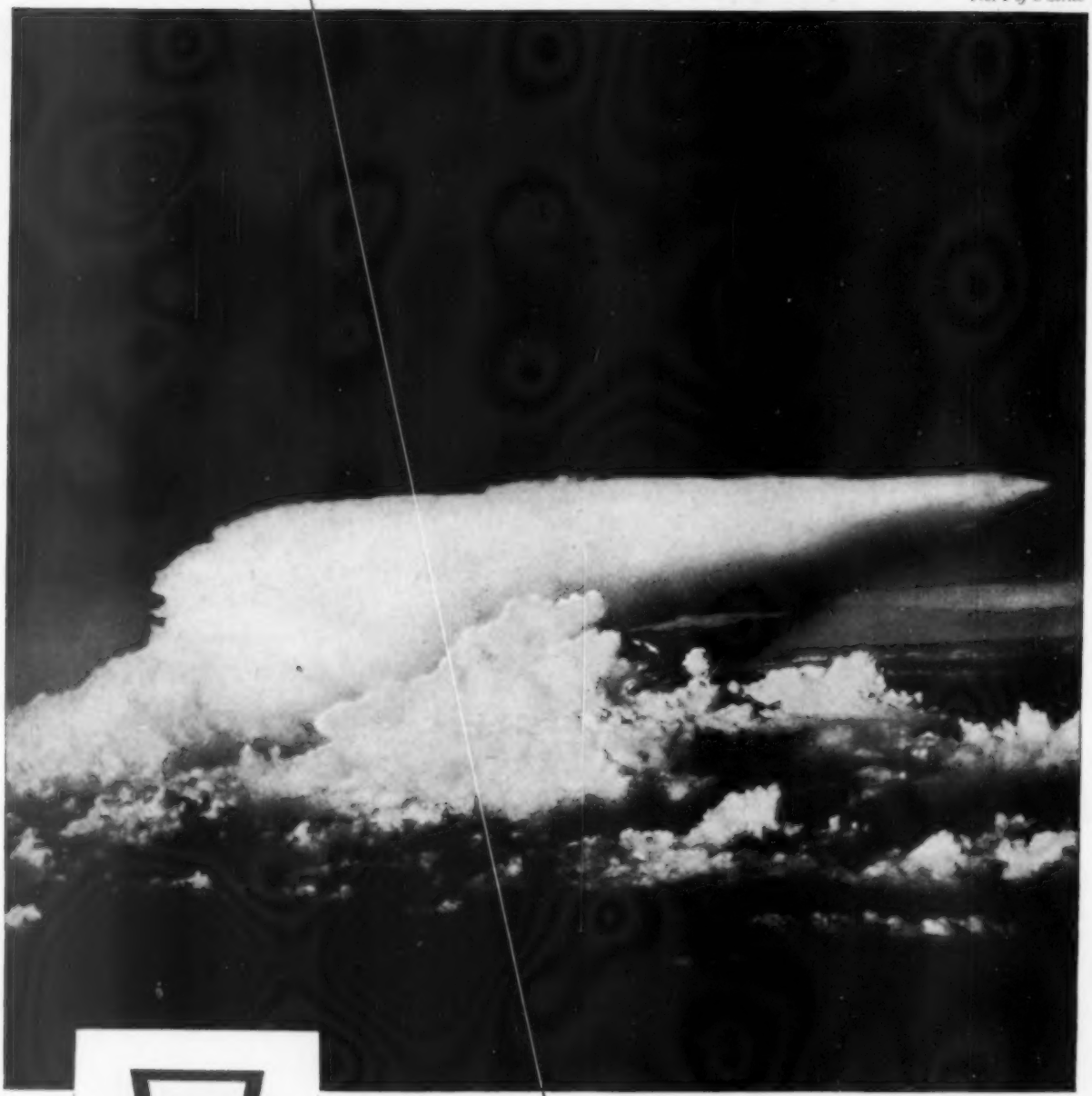

Weather map symbol for Cumulo Nimbus

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High-speed Terminology

SHOP TALK in most industries involves the use of terms and expressions which are barely intelligible to an outsider. This is to be expected and causes no particular inconvenience. Much greater problems are met daily in connection with the exact interpretation of the words of an agreement or other document in the language of another country and in the more straightforward translation of technical terms. On several occasions in recent months we have been approached by readers overseas for advice on the choice of a technical dictionary, and we have had to admit that for aviation matters we do not know of one that has proved wholly satisfactory and up to date. The fact is that new words are added each week to the aviation language, and new shades of meaning to existing ones. Fortunately some of them become international from the outset and therefore require no translation.

There is one group of words which, we think, needs some sorting out, namely, those qualifying high speed. For example, what precisely is meant by transonic? Several aircraft which are unable to exceed Mach 1 or, in fact, to reach above 0.9, are freely described as transonic. Yet others which achieve a fraction over supersonic speed in the dive are also described variously as sonic, transonic and supersonic. Again, the general term supersonic would by itself be inadequate in most contexts, for it permits no differentiation between, say, Mach 1.01 and Mach 10.

We note that for sonic speeds regarded as high today (e.g., above Mach 3) the term hypersonic is now sometimes used, and on occasions ultrasonic. Of these two we would plead at once that "ultra" be confined entirely to those sciences which, concerned with high-frequency sound waves, have been using it for years past. If such a term is needed "hyper" is the one for aviation, if only to avoid confusion.

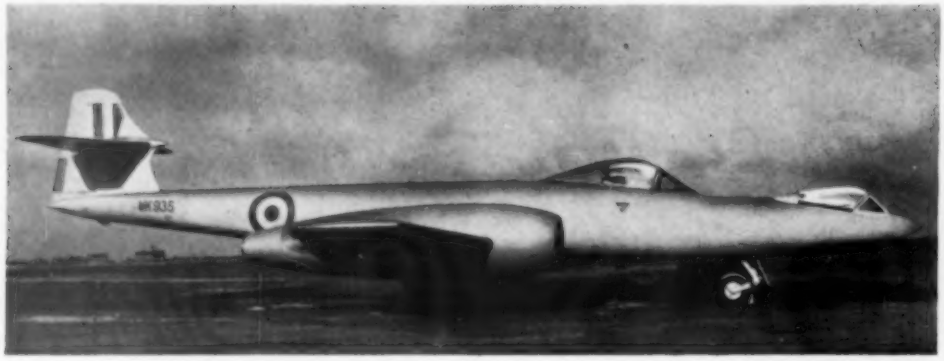
As to what the everyday speed terms ought to mean, we would suggest that a supersonic aircraft be regarded as one that is capable of exceeding the speed of sound in level flight. A transonic machine can then be one which in level flight approaches near to sonic speed and can just exceed it in a dive. There is very little justification for extending the meaning of transonic to include aircraft which (as a whole) attain no more than the speeds at which compressibility effects begin to be felt. For the time being, however, we have to accept that some subsonic dual-control aircraft are described as transonic trainers on the grounds that they provide experience of the symptoms which a sonic machine displays on the approach to Mach 1.

The high and low limits of the transonic regions have not been clearly defined. One authority has suggested 700 to 900 m.p.h., but with these figures we disagree; the high limit does not need to be higher than sonic speed of Mach 1, or 760 m.p.h. When an aircraft has reached this speed much of the airflow over it will already be supersonic. According to their shape—wing thickness and angle of sweep—some aircraft meet compressibility effects at about Mach 0.8, but their limiting Mach numbers would then probably be no more than 0.87. A sonic machine does not start to meet transonic effects until, say, Mach 0.9. Thus the transonic zone may be held to vary for different aircraft; but it is usual to think in terms of about Mach 0.8 to Mach 1.

Farther Ahead

After defining these sonic terms we must observe that the scientist might well regard such popular interpretations as both unsatisfactory and misleading. It is generally known, for example, that a change of airflow occurs when the speed of an aircraft increases from subsonic to supersonic; but it would be wrong to assume that a third kind of flow develops to mark a change-over to hypersonic speeds. The only new sort of "barrier" now foreseen is the heat barrier (increase in temperature with V^2) and this now imposes a practical top speed limit—using present materials and altitudes—at about Mach 5. But by the time man has solved the other requirements to attain Mach 5, there is little doubt that the thermal properties of materials will have been further improved and that flight in the rare atmosphere at much greater altitudes will be quite commonplace.

Aerodynamics have little place in our theme, but we must include superaerodynamics if only to introduce the term. Of this subject we claim no knowledge other than of its association with very low air densities and, for the molecules, large mean free paths.



FLAT OUT: A Gloster Meteor adapted by Sir W. G. Armstrong Whitworth Aircraft, Ltd., for research into the possibilities of the prone-piloting position, incorporated in the nose. The revised fin leading-edge is now standard on late-mark Meteor night fighters. The prone-pilot Meteor was first flown—from the back seat—on February 10th, the pilot being S/L. E. G. Franklin, D.F.C., A.F.C., A.W.A.'s chief test pilot.

FROM ALL QUARTERS

The Avro Fighter/Bomber

THOUGH it has often been remarked that the Avro 707 research aircraft appears to have the makings of a first-rate fighter, it will come as a surprise, even to many who share that view, that this fascinating little aircraft is, at last, being developed into a lightweight fighter/bomber. As yet unnamed, the new machine has been designed to meet NATO requirements as laid down by General Norstad; its rivals appear to be a version of the Folland Gnat (Bristol Orpheus turbojet) and France's trolley-launched, skid-landing S.N.C.A.S.E. Baroudeur.

Sir Roy Dobson, managing director of A. V. Roe and Co., Ltd., puts forward the comment that the delta plan form offers such easy landing characteristics that it is "ideally suited" for use for temporary airstrips. "Our aircraft," he says, "can land without trouble on a minimum NATO P.S.P. runway with room to spare, and can take off in half the minimum requirement." He goes on to claim that the delta offers not only low cost but great strength.

The new Avro will carry a heavy mixed load of rockets, guns and bombs and, according to Sir Roy, General Norstad has written into his specification exactly what he needs in speed and range. "We can deliver more speed and greater range than these requirements," he asserts.

Students of fighter design will learn with interest that Sir Roy is emphatic that the new fighter will not have a tail. Performance characteristics he describes as "astonishing," adding that the price is less than a third that of "the conventional fighter."

Another Air-sea Merger

THE acquisition of a major shareholding in Britavia, Ltd., the independent group which owns Silver City Airways and Aquila Airways, was announced on Monday by the General Steam Navigation Co., Ltd. This long-established company (it was founded in 1824) has a fleet of about 70 ships operating mainly in European and Mediterranean waters. It is an associate of the Peninsular and Oriental Steam Navigation Co., Ltd., which, with a fleet of passenger and cargo vessels whose gross tonnage is over 2,300,000, is one of the largest shipping concerns in the world.

The issued share capital of Britavia is £200,000, and the shares have hitherto been held by British insurance companies and by Cable and Wireless (Holding), Ltd. Cable and Wireless retain their investment; it is understood that the insurance companies' majority shareholding has been bought by the shipping company for an undisclosed sum. Britavia was formed in 1946 and, although the company lost heavily for the first two or three years, its results have improved to a spectacular degree. The present chairman, Mr. M. C. Mekie, took over 3½ years ago, and he will remain chairman of Britavia and its principal subsidiaries.

The share capital of Silver City Airways, Ltd., bulwark of Britavia, was taken over in 1948, at which time the airline was making the first tentative experiments with its now celebrated cross-Channel vehicle ferry services. It is expected that one in three of all vehicles crossing the Channel this summer will be carried by Silver City's fleet of 14 Bristol Freighters and Superfreighters. Ferry services account for about 50 per cent of the flying time of this fleet and an expansion of charter operations is likely to result from the merger with G.S.N.C., with its widely dispersed facilities for attracting and handling freight. Another Britavia subsidiary is Ferry Airports, Ltd., which was formed recently to operate Ferryfield, the private airport under construction as a terminal for Silver City Airways.

The only British flying-boat operator, Aquila Airways, Ltd., became part of the Britavia group in March 1953. In November last year, speaking as chairman of Aquila, Mr. Mekie said that he had offered the Ministry of Supply substantially over £1m apiece for the three Saunders Roe Princess flying-boats. At the time he emphasized their value as aerial troopships. Aquila's present fleet of Solents and Hythes have been used on trooping flights as well as on scheduled passenger services to Madeira and the Canary Islands.

A. Cdre. G. J. Powell and W/C. Barry Aikman, managing directors of Silver City and Aquila respectively, retain their present status. Mr. Mekie and Mr. D. Anderson, deputy chairman of P. and O., were reluctant to discuss detailed plans for the future at last Monday's Press conference held to announce the merger. They emphasized, however, that the agreement is intended to accelerate the development of Britavia, and is not merely a means of consolidation.

This is the third air-sea alliance to be announced this year; the others concerned the Hunting Group and the Clan Line and Airwork and Furness, Withy. Neither involved a controlling interest.

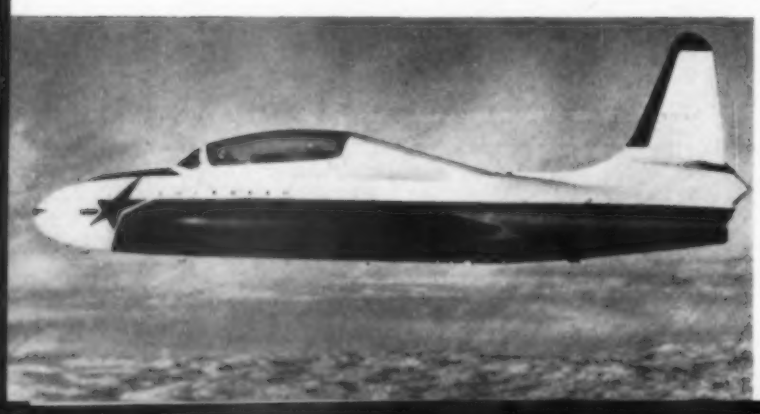
Towards Radar Perfection

RADAR problems that were still unsolved formed the subject of a lecture given to the Radar Association in London on February 10th. The lecturer, Mr. K. E. Harris (director of development, A. C. Cossor, Ltd.), dealt mainly with the application of radar to ground-controlled interception of enemy aircraft in war-time and to airfield approach control in peace-time.

From the beginning, one of the greatest functional shortcomings had been a variable time-lag in the interpretation of the intelligence, in other words, the delay encountered when transferring information from the cathode-ray-tube display to the plotting table. The display had also left much to be desired.

Many technical improvements, such as plan position indication and the "nodding" height-finder, were incorporated to improve the visual display, and the time-lag was reduced. Further attempts were made to improve the visual display, among them a "3-D" type of presentation. Various optical systems using stereoscopic and pantographic techniques were used. With the former, operators experienced considerable accommodation difficulties. With the latter they had to become determined hybrids, using all four limbs simultaneously.

Another interesting development was the system in which the P.P.I. display was continuously filmed, the film being immediately



TANDEM TUTOR: Briefly discussed on this week's "Aircraft Intelligence" page, the Lockheed jet trainer developed from the T-33 is hardly a thing of beauty. This photograph emphasizes the hump-backed appearance resulting from the elevated instructor's seat. The port wing is hidden by the huge tip-tank.

processed and then projected and optically superimposed upon the P.P.I. display. The technical advantages in this method of presentation were outweighed by the coils of used film, which accumulated at an alarming rate, threatening to swamp the operations room with celluloid. This particular arrangement was part of M.T.I. (moving target indication) system development. By superimposing the "past" display on the "present"—about a ten second separation was usual—it became possible to distinguish moving targets from fixed ones.

Mr. Harris went on to talk about the advent of the transponder for the identification of random aircraft and some of the methods used to suppress "clutter" and rain-cloud echoes encountered on the centrimetric equipments.

Turning to the present-day position he thought that the original problem remained unsolved: the C.R.T. presentation still fell short of perfection. Looking toward the future, he envisaged the necessity for a new line of approach, possibly in the development of a system where information obtained by radar was fed into a computer. This predigested information would be continuously compared with a reference or "safety" pattern. If a dangerous situation occurred the system would automatically operate an alarm.

New Percival Director

FROM Percival Aircraft, Ltd., comes the announcement that Mr. F. W. Buglass, M.I.P.E., has been appointed their works director, with effect from February 10th. Since May last year he has held the post of works manager. Born in 1905, educated in Edinburgh, and apprenticed at the Royal Naval Dockyard, Rosyth, he entered the aircraft industry in 1924 as a member of the Boulton Paul design office. At the end of 1927 he went to Blackburn Aircraft as a design-office section leader, and six years later was in charge of their experimental department. In 1935 he returned to the production side as chief planning engineer, and after another two years was appointed production engineer. After the war, in 1945, he returned to Boulton Paul, this time as production manager. He remained with the latter firm until he went to Luton last year as works manager.

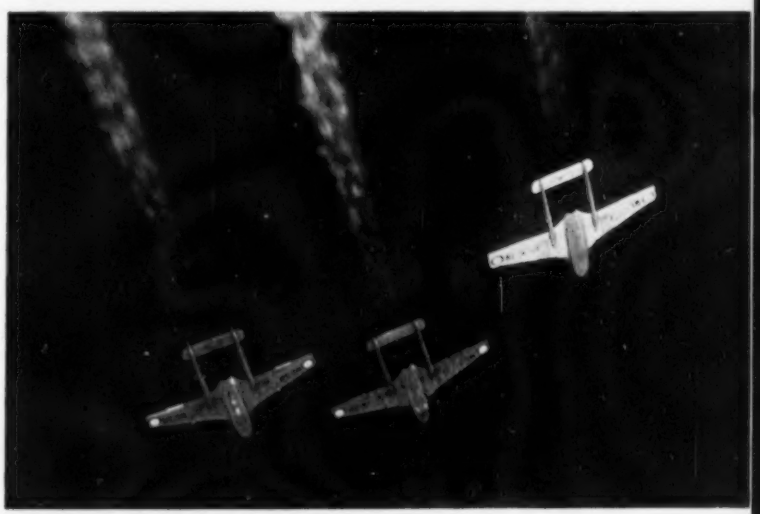
Mr. Buglass.

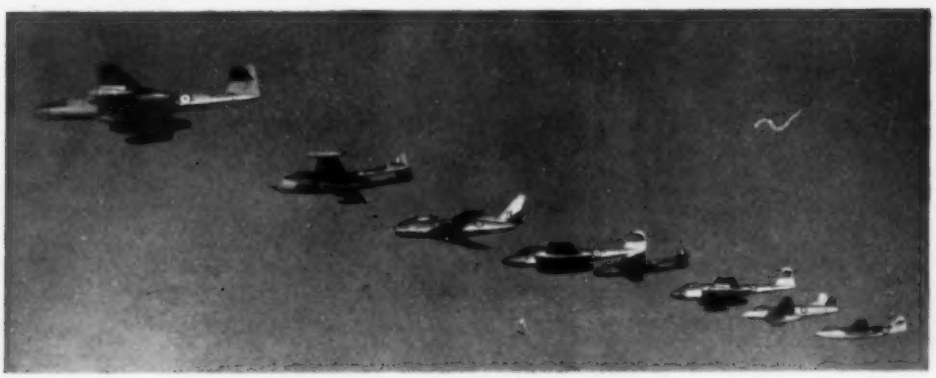
Mr. Shenstone on Aircraft Operation

THE text of Mr. B. S. Shenstone's lecture, which was to have been delivered to the Belfast branch of the Royal Aeronautical Society last week, contains a number of forthright statements. In the event, the author was prevented from presenting his paper because of bad weather at the airports.

He writes as an aircraft operator submitting his problems and requirements to the designers and manufacturers, and deals first with the new-aircraft problem because "it might appear to be the beginning. In fact, in an airline there is no end or beginning, only a constant merging of one inadequate aeroplane into one slightly less inadequate, backed by dreams of the proper aeroplane for the job." Introducing a new type, the operator has hanging over his head the chance of a major defect which may result in grounding the type—"a terrible blow" to an airline. The paper then goes on to discuss servicing facilities, training, stores, modifications and budgets.

WITHOUT PREJUDICE we print these photographs, purporting to show Russia's newest heavy bombers, the "Ilyushin 38," above, and "Tupolev 200." In each case the power plants are said to be turboprops and it will be observed that Convair influence is strongly marked in both designs. The photographs were first published in "Aviation Week," which quotes a span of 168ft for the Il-38 and 236ft for the Tupolev 200.





THE SPICE OF LIFE: The eight varieties of jet fighter shown on the left are, left to right, Meteor N.F.11, Venom N.F.2, Sabre, Meteor T.7, Venom F.B.1, Meteor F.8, Attacker and Sea Hawk. Like the three Venom F.B.1s (above) seen contrailing at 41,000ft, they are flown by pilots of the Royal Air Force Central Fighter Establishment.

ARCHÆOLOGY FROM THE AIR

A Rewarding Pursuit for the Private Pilot

By W. A. BAKER

TO some people the word "archæology" may still conjure up the stock picture of old gentlemen with white beards, studiously engaged during their declining years in digging up the past. Today, however, modern techniques have helped to make the subject an exact science. The most notable development is that of observation and photography from the air.

Apart from sites readily visible on the ground, air photographs can record ancient features such as filled-in ditches and buried foundations invisible to the ground observer, yet betrayed to the camera by slight shadows, soil marks and markings in crops sensitive to the disturbed soil. The great range and high angle of view immediately relate these features in a broad and intelligible pattern. In many districts flying is the only satisfactory means of discovering and recording sites of archæological interest, because the areas in question are too remote to be reached easily by other forms of transport.

Some little time ago it seemed to me that club members and private owners could put their flying ability to good use in field archæology. With this in mind I decided to carry out some experiments, using a club Tiger Moth; and my colleague Eric Hesketh, a keen amateur photographer, joined me in developing a technique. His enthusiasm and expert handling of a camera in the confined space of the Moth cockpit has made it possible to achieve satisfactory results.

It was decided that photographic operations, using a K24-type reconnaissance camera fitted with an Aero-Ektar 7in lens, should be conducted from the front cockpit since by this means it is infinitely easier for the pilot to position the camera and operator on the target. For accuracy, the final sighting instructions can be given by the photographer, but care must be taken to avoid including parts of the aircraft in the picture. Here, perhaps, a word of warning: it is all too easy for the pilot to be talked into an alarming altitude by an over-enthusiastic photographer who, with his eye glued to the sight, is more intent on getting it all in than worrying about Newton and the apple!

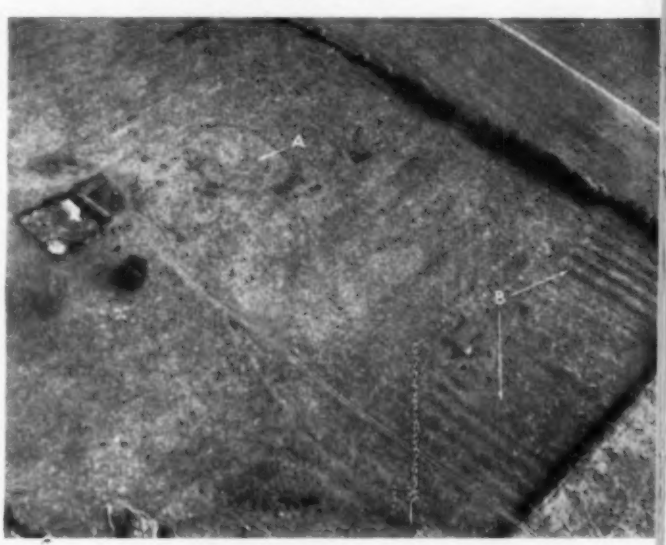
To simplify camera operation the port-side door was removed, and well-wishers were of the opinion that the camera should be equipped with its own parachute; but it is, of course, firmly secured. Experimental results from the first flight were very gratifying and no vibration effects were noticeable on the negatives, with or without engine. This was important, since it meant that throttle could be used liberally when required.

Having once located a site, it is as well to fly round it to determine the best lighting conditions. An approach is then made in level flight, to one side of the target, while the camera is put in position; by lowering the port wing and nose of the aircraft the camera can be quite accurately aligned. Any changes in attitude must be made smoothly and quickly. Steady and careful flight is essential, or movement will result on the negative. It is important to avoid getting too close to the target or under-estimating drift on the run in, since the attitude will become too steep and decidedly uncomfortable; also, more height may be lost than is necessary.

It is as well to take more than one photograph from different approaches. A high-angle oblique can be obtained, when close to the target, with about a Rate 2 turn and nose down as required. The height lost is entirely dependent upon the photographer, whose action must be quick and decisive. A glide approach or side-slip is not recommended, since too much height is lost and there is a tendency to assume a steeper attitude than necessary, thus limiting the time available for photography. During the approach the pilot must keep one eye on the site; the other must be firmly fixed on the A.S.I., since it is remarkable how persistently low that instrument will read!

Observation and reconnaissance are best carried out at about 2,500ft, giving a wide field of view together with reasonable ground detail. For photographic purposes 1,000 to 1,500ft will enable good results to be achieved, but height obviously depends

Draughty pastime: The author in a club Tiger Moth, with his colleague Eric Hesketh wielding the K24 camera.



A typical discovery: The dark circle surrounding the arrow at A possibly indicates the site of an ancient cattle-pound, or of a ploughed-out barrow (burial mound). At B is mediæval ridge-and-furrow cultivation.

(Below) General view of an Iron Age fortress, known as the Herefordshire Beacon, in the Malvern Hills. With lighting-angle carefully selected, the aerial camera clearly reveals the line of the defences.

(Left) Another of the Tiger Moth team's pictures, this time showing a so-far-unexplained marking on the eastern rampart of another ancient fortress in the Malvern Hills. (Right) Near a modern farm are A, foundations of an ancient building; B, line of old trackway; C, mediæval cultivation.

upon the extent of the site. An oblique from 1,500ft should be taken at an angle of not less than 45 deg, otherwise the composition of the picture will be too flat, resulting in the significance of the site being lost. If, in an endeavour to fill the negative, the photograph is taken too low down, ground detail can become excessive and the site will be difficult to resolve.

Shutter speeds of 1/500th sec at f/5.6 will give good results in summer sun, and 1/500th sec at f/4 in November sun, and it is as well to double the exposures in the late afternoon. Speeds as slow as 1/150th sec can be used with little resulting movement provided that steady flight is maintained. A D.109 yellow filter was used, giving good contrast. The K.24 can also be adapted to take a plate giving a considerable improvement in definition and speed, although 1/500th sec is the limit with this camera. For high-angle views, infra-red plates are also worth a trial, taking advantage of their haze-penetration factor.

In due course my colleague turned his attention to the use of a 35 mm camera. He found that good results can be achieved, even in an open cockpit, provided that the camera is mounted on a hand grip and operated by a flexible cable release. In this way the sighting problem is easier and vibration effects are reduced to a minimum. A larger number of photographs can also be taken in a given time, and a wider use of filters is possible. An important feature is that the cost of photography can be appreciably reduced, though one disadvantage is that the target must occupy a fair portion of the negative, since the film grain will limit its enlargement. When using an open view-finder care must be taken not to venture too far out into the void, since the slipstream is likely to return it to its closed position, putting a very different interpretation on the popular expression "And the skin off your'n!"

Archæological societies and groups welcome the assistance of flying clubs in this field. Even with the aid of the camera, air observation alone will provide much useful information. Spring and summer, when advantage can be taken of the growing and ripening crops, are the most profitable seasons. The pursuit also provides good exercise in pilot navigation, map-reading and recording observations accurately, since only one particular field may be of interest. A Tiger Moth is not, of course, an ideal aircraft for the job, and certain other types of light aircraft would almost certainly be more suitable.

Contributions to field archæology have been made by both amateurs and professionals and there is much photographic material available for reference; but the technique must be worked out to suit the individual. I have in mind the work of the late Major G. W. G. Allen, M.C., who, between 1933 and 1939, flying alone in his own Puss Moth with a home-made plate camera, made an outstanding contribution to the science. The technique was much more difficult than our own—stick between the knees, camera over the side. His collection of over 1,500 photographs may be seen at the Ashmolean Museum, Oxford, and will adequately repay a visit by those interested in the subject. I should like also to record my appreciation of the encouragement we have received from Mr. J. S. P. Bradford, Pitt Rivers Museum, Oxford, and Dr. J. K. S. St. Joseph, Curator in Air Photography, Cambridge, both of whom have carried out a tremendous amount of work in this field.

Although this country has been well photographed there is still much work to be done, and flying clubs can make interesting discoveries in their own areas, and provide valuable assistance in solving specific problems. Finally, much information and further references can be obtained from various publications among which may be mentioned *Wessex from the Air*, by O. G. S. Crawford and A. Keiller (Oxford University Press); *Field Archæology*, by R. J. C. Atkinson (Methuen); and *The Technique of Air Archæology*, by D. N. Riley (*Archæological Journal*, C.1, 1).

BAGINTON'S LAST

ASSOCIATED with the testing of Armstrong Whitworth aircraft since 1936, Baginton airfield, near Coventry, is to be closed to experimental flying. Final-assembly and flight sheds for Sea Hawks and Sapphire-Hunters are being transferred to Bitteswell, near Lutterworth, where there are concrete runways.

Baginton is a grass airfield and is no longer suitable for jet operations, though it will continue to be used for civil flying as well as by Armstrong Whitworths for liaison flying. During the eighteen years since the airfield was opened nearly 5,000 aircraft have made first flights there.

The A.W.A. factory and airfield were built on land bought in 1897 by the Coventry Corporation. In 1933 the City Fathers decided to establish a civil airfield on the land, and work on this project started at about the same time as A.W.A. began construction of the hangars. On May 26th, 1936, the first aircraft took off from the new field; it was a Scimitar, piloted by Mr. A. C. Campbell-Orde, at that time A.W.'s chief test pilot and now B.O.A.C.'s operations development director.

The A.W. hangars were built to house Whitleys, and at the peak-production period in 1942 these bombers were being delivered at the rate of twelve a week. Altogether 1,814 were flown out of Baginton. The Whitleys were followed by 1,081 Lancasters and nearly 300 Lincolns. Later types included the A.W.52G of 1945 (this was a glider used to try out features of the A.W.52 jet-propelled flying wing research aircraft), the Apollo four-Mamba airliner (1949) and Gloster (Armstrong Whitworth) Meteor N.F.11 night fighter (1950). The last experimental machine to take off from Baginton—on February 10th—was the prone-pilot Meteor illustrated on p. 198.

RADAR EQUIPMENT DELAYS

THE complaints about alleged delay in the ordering of radar equipment for British aircraft were voiced in the House of Commons recently by Mr. L. W. B. Teeling (Con., Brighton Pavilion). He further asked what steps were being taken to co-ordinate the requirements of the R.A.F. and factories building aircraft for State airlines, so that orders were put in in time to have new aircraft fitted immediately; the aircraft were otherwise completed and ready for delivery.

Mr. Duncan Sandys, Minister of Supply, said he was not aware that there had been any avoidable delay.

Mr. Teeling asked if he was not aware that the radar firms felt that sometimes the prototypes were actually in the air before the radar orders were placed, which might well mean 18 months' delay. In some cases they considered that aircraft might almost be obsolete before the equipment was produced.

Mr. Duncan Sandys, Minister of Supply, said he was not aware electronic equipment new technical advances were being made all the time. His department had continuously to try to balance the advantages of early delivery against the advantages of incorporating some subsequent new development. They did their best to arrive at some sensible compromise and he was not aware of any complaints in a continuous situation of having to balance one advantage against the others.

When Mr. Philip Noel-Baker (Lab., Derby South) asked if British civil aircraft were now supplied with those radar safety instruments now available, the Minister replied that that was not the responsibility of his department. The Corporations usually placed their orders direct with the manufacturers and, of course, very little Service equipment was in fact used in civil aircraft.

HERE AND THERE

FIRST OVER THE ANDES was a Bristol M.1C monoplane. Piloted by Capt. Dagoberto Godoy, of the Chilean Military School of Aviation, it made the crossing on December 12th, 1918, and the scale model of the machine seen in our picture has lately been presented to the National Air Museum, Washington, by the Chilean Air Force. The model is being held by Mr. P. E. Garber, head curator of the Museum; on the left is G/C. Phillip Haynes, the British air attaché in Washington and, on the right, Colonel Enrique Florez, the Chilean air attaché in the same capital.

In Memory of a Victory

THIS year's Battle of Britain Week is to be observed from September 13th to 19th inclusive.

Blériot Lecture on Helicopters

THE R.Ae.S. announces that the seventh Louis Blériot Lecture is to be held in Paris on March 10th, when Mr. Raoul Hafner (chief designer, helicopters, Bristol Aeroplane Co., Ltd.) will speak on *The Domain of the Helicopter*. The Louis Blériot Lectures, inaugurated in 1948, are held alternately in London and Paris.

Power Jets Directorship

THE Minister of Supply has appointed to the Board of Power Jets (Research and Development) Ltd., Mr. V. P. Harries, C.B., Under-Secretary (Contracts) at the Ministry. Mr. Harries replaces Mr. W. F. Jenkins, C.B., C.B.E., who has resigned from Power Jets' Board on his appointment to the Department of Atomic Energy. Mr. Harries joined the M.o.S. in 1939 and was appointed Under-Secretary in 1949.

Hydraulics Lecture Prize

THE Water Arbitration Prize of the Institution of Mechanical Engineers has been awarded jointly to Mr. E. G. Collinson, B.Sc., A.F.R.Ae.S., and Mr. H. G. Conway, M.A., M.I.Mech.E., F.R.Ae.S., for their paper entitled *An Introduction to Hydraulic Mechanism Theory*. Mr. Collinson is chief designer of British Messier, Ltd., and Mr. Conway was their technical director until last October. The paper was an account of the company's work in the field of hydraulic servo-mechanisms for aircraft and other applications.

Degrees of Safety

SPEAKING recently at the annual dinner of the Institution of Mechanical Engineers, Automobile Division, the president of the Royal Aeronautical Society, Sir William Farren, said he was not sure that the risks in aviation were greater than those in ordinary life. When travelling by train he personally felt the need for as many lives as those of a cat. He added that it should not be thought that the aeronautical world was not taking matters seriously; it was gaining experience, but not at the expense of the public. He especially congratulated B.O.A.C. on the steps they are taking.

Heavy Load—and Opposition

A PROVISIONAL licence authorizing a firm of aerial topdressing operators to make 60 hours of tests with a Bristol Freighter has been granted by New Zealand's Air Services Licensing Authority. The application was opposed by 18 topdressing concerns in the North Island, and by the Aviation Industry Association, but the chairman of the Authority, Mr. E. L. Blundell, said it was felt that a licence would be in the public interest. The Authority, however, imposed certain conditions, chief of which was that the tests would have to be completed by May 31st, and that they would be carried out from Masterton Aerodrome. Some 40 firms, mainly operating Tiger Moths, are engaged in aerial crop-fertilization work in New Zealand.

HELICOPTERS REVIEWED

FOLLOWING the success of last year's Helicopter Number of *Flight*, which sold out immediately on publication, it has been decided to produce another such enlarged special issue this year. It will appear on March 12th, and among numerous special features will be a review of the world's helicopters and their power-units. We suggest that readers should place advance orders with their newsagents.

Reward for Life-saving

IN recognition of the contribution of Mr. Leslie L. Irvin and the Irving Air Chute of Great Britain, Ltd., to the war effort by the design and manufacture of aircrew and supply-dropping parachutes, the Ministry of Supply has awarded the Letchworth company a sum of £68,000. This award—which will be reduced to £37,400 by taxation—is believed to be the largest ever made in the parachute industry. Mr. Irvin, founder of the company, has waived any claim in respect of his own services—which included the very rapid expansion of supply-parachute production for the Burma campaign—and has generously authorized distribution of part of the £37,400 among present employees who were with the company during the war.

Flying Training's A.O.C-in-C.

FURTHER to recent references to the handing-over of the hundredth production Percival Provost to the Royal Air Force it should be added that Flying Training Command has, of course, been commanded by an air marshal for several years. The officer concerned, Air Marshal L. F. Pendred, C.B., M.B.E., D.F.C., has held that rank for nearly two years.

Helicopter Low-flying Charge

FINES totalling £50, with 30 guineas costs, were imposed by Woolwich Magistrates' Court last week on the *Evening Standard* and their helicopter pilot, Capt. Alan Green. They answered summonses, under the Air Navigation Act, alleging that the helicopter (a Westland-Sikorsky S-51, G-ANAL) flew over a town at less than 1,000ft above the highest obstacle within a radius of 2,000ft and that it thereby caused "unnecessary danger to persons and property on land." The case arose out of a photographic flight on September 11th, when a Meteor crashed in Woolwich Arsenal. Witnesses said that the helicopter descended to 60ft.

ROYAL MAIL: Stamps commemorating the Royal visit to Australia appeared for the first time recently on letters arriving in this country. The cover shown here, received via Qantas, was posted on the first day of issue.

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BEAVER in MEXICO

Demonstration Tour in a Land of High-altitude Airfields

By ROBERT WILSON

WITH the co-operation of their agent in Mexico, de Havilland Aircraft of Canada last year sponsored a Beaver (450 h.p. Pratt and Whitney Wasp Junior) demonstration tour throughout the Republic of Mexico. The crew consisted of D.H.C. pilot Doug Givens and one of the company's public relations officers, Bob Wilson, whose account of the trip, in somewhat abridged form, we print here. Various passengers were carried on the tour, a noteworthy feature of which was the Beaver's take-off performance from the high-altitude airfields characteristic of the Republic. The article is followed, overleaf, by some notes on the development of the Alvis-engined Beaver 2.

OUR journey from Toronto to the U.S.-Mexico border crossing point of Brownsville, Texas, was made *via* Detroit, Indianapolis, St. Louis, Springfield, Tulsa, and Dallas. After a customs clearance stop at Tampico we headed for Mexico City, where we were to report to our Mexican agent, Sr. H. Mariscal, and pick up the D.H. service representative, Paddy Kissack, together with Sr. Mariscal's flying salesman, Piloto Abe Murillo, who was to act as our guide and interpreter. We arrived there about noon through a hole in some mighty tall cumulus that was building up over the mountains.

Mexico City, built on the bed of an ancient river, is in a flat valley at an altitude of 7,000ft a.s.l., and is completely surrounded by tall mountains, the highest of which is 16,000ft—the famous volcano Chupultipec.

Thus began our grand tour of the Estados Unidos de Mexico. We visited towns whose only commerce and contact with the rest of the country was by boat over long tortuous routes, or by air; and villages accessible only by burro or by air. Landing strips varied in length from 800ft to 1,200ft.

The Beaver's tour was a success from any angle—publicity for the airplane, goodwill for de Havilland and, on a broader scale, for Canadians and their products. Immediately upon our arrival in Mexico City we had a signwriter paint upon each side of the Beaver "*Hecho en Canada*" (Made in Canada).

In particular, the aircraft had two outstanding opportunities to prove its makers' performance claims. Perhaps the most dramatic was at the airstrip of a coffee plantation at Teutila, in the heart of the High Sierras. The strip itself is the shaved-off top of a mountain 3,500ft high. It measures 800ft long and 60ft at its widest point (the narrowest is 35ft). To approach the strip, you fly up a gorge, the mountains on either side of which range from 7,000ft to 11,000ft. The approach end of the strip is the sheer face of a cliff with a 2,000ft drop. The strip runs upgrade at about 15 deg and ends at another mountain rise of 1,500ft.

Before the Beaver, two other airplanes had gone into Teutila, both personal-type light planes. The smaller of the two was still there, unable to take off; the larger was making four or five trips a day with light loads. When we first arrived at the coffee plantation we offered the owners a demonstration flight in the Beaver. They asked if we would please take off and land again, thus proving that the Beaver could get in and out, before they would trust themselves with us.

Another place where the Beaver's ability to operate from tight spots which was put to the test was Cuatotalapan, where one of the partners of our Mexican agent had a large plantation, located about four miles from the landing strip. The strip is a flat, grassy stretch about 900ft long, being quite usable in the dry season, but in the rainy season usually about a foot under water. Cuatotalapan is approximately 300 miles south-east of Mexico City, in rough jungle country.

We flew over the plantation and, after thoroughly buzzing it, went to the strip and landed. Sr. Saenz and his friends arrived a few minutes later on a small, narrow-gauge private railway train consisting of two flat-cars drawn by a loud, wheezing gasoline engine. We and our bags piled aboard. When our host had set two guards armed with rifles to watch the Beaver, we chugged back to the plantation.

The following morning we left for Villa Hermosa, almost on the Border of Guatemala. The temperature was 105 deg; we were back at sea level.

From Villa Hermosa we went on to Frontera, a small town right on the Guatemalan border. We left the Beaver on the landing strip, which is about three miles from town, and proceeded by taxi to Frontera to find our prospective customer. Having completed our business, we drove back to the strip, to find the Beaver surrounded by Customs and Immigration officials, all armed with the usual .45. As Doug Givens was the only one who had brought his passport and papers from Mexico City, and Paddy Kissack and I were both foreigners without papers, we let Doug and our Mexican guide do the talking.

Tapachula was our next stop, a delightful town with some delightful customs, but with a most undelightful temperature of 104 deg. The town seems to radiate from a central square. Surrounding the square are open-air cafés and it seems that every evening, promptly at eight o'clock, all the unattached girls and boys gather in the square. The girls walk anti-clockwise in twos, threes and fours, and the boys walk clockwise, each interestedly eyeing the other. Presently they fall out of the parade in pairs and then, one assumes, proceed to discuss the future possibilities of a sustained courtship.

Arriving in Acapulco, Mexico's famous Pacific resort, on a Saturday evening, we decided to spend the Sunday there. We stayed at one of the better-known tourist hotels and were treated accordingly. Next day we returned to Mexico City to take part in the 25th anniversary of civil aviation in Mexico. The Mexican authorities celebrated the occasion with due pomp and ceremony: colourful uniforms, parades and flag raising by the Mexican Military College and all branches of the Armed Services, speeches by everybody who was anybody (Doug and I did *not* give one), and a static display of all types of aircraft operating, or for sale, in Mexico. The Beaver and a Dove were both part of this display.

The ceremonies were held in the new multi-million dollar building at Mexico City Airport, which on completion will be one of the most beautiful examples of air-terminal architecture in the Americas. After the ceremonies, the Beaver was granted official permission to give a flying demonstration.

The airport is 7,400ft above sea level, but even at that altitude, the Beaver's performance was just as sensational to the local onlookers as a sea level take-off is to us. The demonstration became a highlight of the cocktail party, the guests at which included all the civil and military brass with the exception of El Presidente, who, I understand, was ill.

Before leaving Toronto, we had received a letter of introduction from the Mexican Consul to a Colonel Gaxiola (Mexican Air Force), who was a member of the President's household staff, and who also turned out to be Air Adviser to the Governor of the State of Hidalgo—one of the most progressive governors in Mexico.

Hidalgo is the silver-mining state of Mexico; its capital, Pachuca, is approximately 60 air miles from Mexico City. We made an appointment for a Sunday morning and landed at what is considered one of the most dangerous fields in Mexico (to me they are all dangerous). Surrounded by high-tension wires, the airport had experienced eleven fatalities in the past year. It is 8,300ft a.m.s.l.

We buzzed the town and landed at the field two miles away. Shortly afterwards the Governor, his daughter, the Governor's *aide de camp*, and a groom appeared on horseback, galloping madly towards the airport (the daughter wore riding boots and a pink frilly dress and rode sidesaddle—excellent horsewoman, too, if not too gentle on her horse's mouth).

The Governor declined to fly in the Beaver, wishing to watch from the ground. The passenger list consisted of the daughter, the *aide*, and several mine operators, to make up a total (with Doug) who weighs-in at 235 lb) of six. The Beaver, fully loaded, cleared the H.T. wires with several hundred yards to spare.

After the demonstration, the Governor asked the Pachuca chief of police, who was also on the scene, if he would take us

The Beaver seen against a tropical background at Villa Hermosa.

BEAVER IN MEXICO . . .

to lunch at the businessmen's club at Pachuca. After making arrangements to meet the official party again at the airport at 2.45 p.m., we had lunch and returned at 2.30 p.m., only to find the Governor and his party had been at the appointed place at 2.15 p.m., and had since started for Mexico City (too many interpreters, I guess).

We took off and Doug flew full speed at tree-top height along the highway, eventually overtaking the Governor's station wagon, which was barrelling along with siren going and red fender light blinking. We circled the car a couple of times and then landed at an abandoned military strip, fortunately only about half a mile away.

Paddy Kissack and I exchanged places with the Governor and his daughter. They took off in the Beaver and we also took off (literally) in the station wagon, which was driven by the chief of police, complete with .45 and sub-machine gun. I enjoyed that ride to Mexico City; I was sure everyone we passed thought we were either important officials or political prisoners.

A couple of days later I returned to Toronto. Doug Givens and the Beaver continued the tour, flying over most of Northern Mexico and visiting and demonstrating at some of the highest airstrips in the country, including Tobica (8,900ft a.m.s.l.), Uruapan, Guadalajara, Tepic, Mazatlan, St. Ignacio, Tayalitito, Cerliacan Bamoa, Los Mochis, Chihuahua, Torreon, Gomex Palacio, Saltillo and Monterey. At take-off from these places with crew of two, baggage and full tanks, the Beaver's gross weight was about 4,200 lb.

BEAVER FOR EUROPE

How the Alvis-engined Series 2 was Developed

THE experiences with the D.H.C. Beaver 1 recounted in the preceding article add particular interest to the following account, from information provided by the parent de Havilland company, of the development of the design into the Series 2 version with more powerful Alvis Leonides engine. This machine has even better short landing and take-off characteristics than the P. and W.-powered version demonstrated in Mexico. Some comments on the handling of the Series 2 prototype, written by the Editor, were printed in our August 21st issue. Brief comparative data are given below.

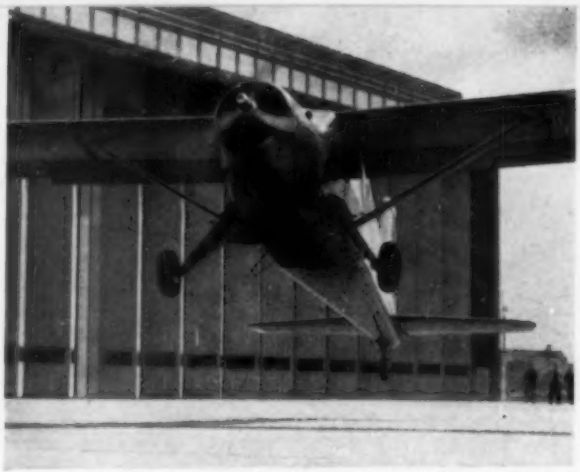
The Series 2 development was undertaken with a view to producing a "European" version. With the Beaver's world-wide usefulness its application in Europe tended, obviously, to become a question of economics. The modification, therefore, centred upon introducing a European engine into the basic airframe, and enhanced performance was an additional result.

The engine selected was the 550 h.p. Alvis Leonides 502/4 with a de Havilland three-bladed airscrew. Initial studies showed that maximum gross weight would thus be increased to 5,100 lb, and that landing and take-off performance would show an improvement over that of the Beaver 1 despite the increase in power-plant weight.

Before the English engine and airscrew arrived in Canada, initial modifications were undertaken, aimed primarily at improving the landing performance in readiness for the increase in weight. Two measures were successfully applied. Firstly, the incidence of the wing was increased from zero to +2 deg by modifying the rear wing-root attachment fittings. Secondly, the wheel brakes were improved—this had to be done in any case, in order to hold the increased thrust of the Leonides during ground running at full power. The brakes themselves were felt to be adequate for the new loads, and it was a question of "stiffening" the brake circuit and achieving maximum brake power with less pedal deflection. To this end, a mechanical connection was installed which positively linked the left and right rudder pedals.

The results of these modifications were highly satisfactory. Pilots found it possible, in landing, to stall the aircraft neatly onto three points with no danger of touching tail-first. The increased wing incidence gave greater drag during the ground run, and the flap and drooping-aileron high-lift system of the Beaver 1 was not interfered with. Further braking effect was expected from the increased windmilling drag of the new three-blade airscrew.

The next line of development clearly centred round the fin and rudder arrangement. It had been found in the Beaver 1 that it was tiring to maintain a set heading during protracted stage-lengths, especially in the seaplane version. The prototype Otter also showed a tendency to yaw due to engine torque, which at times was sufficiently pronounced to cause fin stall. To improve weathercock stability, as well as to allow for the increased torque of the Leonides, a new fin and rudder were designed, providing an area increase of no less than 65 per cent over the original, yet still using the same mounting points. A rudder tab was incorporated to allow for asymmetric external loads, and the rear fuselage was strengthened to accommodate increased side-loads. The incidence and brake modifications were first flown in December 1952, and tests on the new fin were carried out in January 1953, both on the D.H.C. factory's own experimental Beaver.



Though a demonstration take-off picture of this kind is not necessarily proof of performance, the Series 2 Beaver has, in fact, an exceptional ability for getting away in lively fashion, even at full load.

In February the engine and airscrew arrived from England and were weighed. It was found that the new combination would entail an increase of 96 lb in empty weight, although subsequent modifications might reasonably be expected to reduce this penalty. The Leonides, 100 h.p. more powerful than the Wasp, weighed some 107 lb more, while the airscrew was 10 lb lighter, despite its three blades and 6in greater diameter. The additional 100 lb in the nose caused no c.g. troubles. At full load, the c.g. of the Beaver 1 was in any case near the after limit, and could be allowed to travel forward without adverse effects. In the half-loaded condition, the slight risk of nosing over on using full brake during landing could conveniently be counteracted by the addition of a small quantity of ballast, or by the weight of such radio equipment as a customer might specify.

A set of cowlings had been made before the Leonides arrived, and as soon as the engine mounting (of welded steel tubes) had been constructed the power-plant was fitted. Some difficulty was experienced with pipe connections, since the engine had English threads and the airframe American. Adaptors were, however, quickly produced. The accessory-compartment cowling and the induction system were finally added, with carburettor intake ducts so arranged that air could be drawn direct through an under-engine scoop, or alternatively through a filter or between the cylinders, as required. While this was being done, extensive instrumentation was installed, complete with automatic recording camera.

Early test flights revealed no major snags. It was found, however, that the engine ran slightly hot during the standard five-minute climb at take-off power. Wool-tufting revealed poor airflow from under the cowling immediately forward of the windscreen; this section was therefore blanked off and the lateral openings slightly extended. The tufts, incidentally, were photographed from another Beaver flying in close formation. Although as lightly loaded as possible, the photographic machine had difficulty in keeping up with the Beaver 2 on the climb.

These engine tests had shown that a slightly smaller vertical tail would suffice. One was accordingly constructed, and was fitted at the end of the test programme. Stability tests (for which a large boom with swivelling pitot-head and yaw-and-pitch vanes was fitted, as well as extensive instrumentation) raised no snags. The only criticism was that the aircraft tended to roll to the right at the stall before developing a definite nose-down pitch. This was remedied by slightly off-setting the fin; thereafter the normal coarse use of rudder corrected wing-drop at the stall.

The Canadian Department of Transport's approval tests followed immediately on the company's own flight tests, and only 23 weeks after the beginning of the Series 2 development the aircraft was fully tested and approved. As noted in these columns last year, the Beaver 2 then came to England and was demonstrated at the S.B.A.C. display at Farnborough.

Beaver Series 1 and 2 Performances at 5,100 lb a.u.w.

	Series 1	Series 2
Max. cont. weak cruising	133 m.p.h.	138 m.p.h.
S.l climb max. power (5 min)	1,100ft/min	1,460ft/min
Service ceiling	19,500ft	23,000ft
Range, cruising, 1,000 lb payload, with fuel reserves	600 st. miles	600 st. miles
Min. take-off to 50ft	300 yd	250 yd
Min. landing from 50ft	300 yd	300 yd

ANALYSING the BEVERLEY

R.Ae.S. Brough Branch Hears Lectures on Design, Production and Flight-testing

AT the R.Ae.S. Brough branch meeting held in Hull on February 3rd, three executives of Blackburn and General Aircraft Ltd., each lectured on one aspect of the Beverley. First to speak was Mr. C. W. Prower, assistant chief designer, who discussed the specifications and design history of the aircraft.

Designing the Beverley. Mr. Prower began by saying that as the aircraft had first been ordered to a military specification he would deal initially with military requirements. Of these there were two, the strategic and the tactical. The former called for the transporting of military stores and personnel from one theatre of operations to another. Here air transport was a vital factor, because of the number of fighting troops which would otherwise be held ineffectively in transit by other methods of transport. This country had no strategic air transport as such, and the Beverley could fill the gap. Tactical transport required the movement of men, equipment and supplies right into the forward areas where no proper airfields might already exist. The Beverley was originally conceived, during the war, for such missions.

Gliders used in war-time were now considered too cumbersome, and at the time of the first Beverley design-studies the technique of parachuting really heavy items of equipment had not been developed. The original design therefore provided for the aircraft to be powered by four Merlin 90s, carry a payload of 20,000 lb and weigh 75,000 lb all up. The load was to be carried in a container with its own undercarriage (tracked) and long-travel shock-absorbers. The aircraft was to fly slowly over the dropping zone at a height of a few feet and release the container, which would subsequently be brought to a standstill by very powerful automatic brakes. Alternatively, since such an operation demanded too much of the pilot under operational conditions, the container was to be dropped under a cluster of parachutes. A parachute-drop at this weight, however, had not yet been achieved, even nine years after the design proposal.

The next design submitted was for a 20,000 lb payload and four Hercules 100s, but this was enlarged to 38,000 lb payload, four Centaurus, 500 miles range and an a.u.w. of 126,000 lb. The undercarriage was tracked and arranged to be semi-retractable both in the air and on the ground. The wing was larger than the Beverley's, as the performance was to be equivalent to that of a glider. Heavy parachuting was still some way off. This design also was discarded, because of its size and expense.

By the end of 1945 requirements began to crystallize and a specification was finally issued for what was now known as the Freighter I prototype; payload 25,000 lb and still-air range 500 miles, equivalent to an effective range of only 250 miles. It was to be a tactical transport with fixed undercarriage, low wing-loading and braking airscrews, suitable for trooping, parachuting, casualty evacuation, glider towing and heavy parachuting. Bristols developed a two-stage supercharger Hercules to meet the required ceiling of 18,000ft; a wing loading of 30 lb/sq ft and span of 162ft were chosen, with large-chord N.A.C.A.-section flaps. The braking airscrews were to enable it to land fully loaded in any space from which it could take off at light load.

Heavy parachuting was achieved with the aid of a series of special containers suspended from a ceiling gantry. An electric motor and endless chain were eventually to unload them through the stern door. Estimated changes of trim indicated that two large items weighing 9,000 lb each could be dropped safely in quick succession. Provision was also made for the carriage of twenty-four 300 lb airborne supply containers beneath the fuselage.

Components for two prototypes were made at Feltham and one aircraft assembled at Brough for its first flight, which took place on June 20th, 1950. The other parts were stored. The bogey undercarriage which has become standard was experimentally fitted in 1951.

Subsequent developments, principally in parachuting, meant that the all-up weight could be increased without enlarging the airframe; that landing in unprepared forward fields would prove unnecessary, because airfield-construction equipment could be parachuted in first; and, finally, that sufficient endurance would be required to return to the take-off point after each mission.

These modifications led logically to the second prototype, which thus acquired the advantages that it went some way towards providing a strategic transport and that in the civil version, it would show a large reduction in operating cost per ton-mile. Civil applications had, of course, been constantly kept in mind throughout the programme. American development of the floor-roller system of cargo-dropping allowed a further increase of payload, space for which was found in the tail boom, where a passenger/troop compartment was arranged. The tail boom was also tilted upwards slightly to keep the tailplane clear of slipstream in the climbing attitude.

The airscrews of the second prototype were restricted to 14ft 6in diameter, because the engine spacing was for Hercules engines. The full 16ft 6in diameter would in due course increase performance.

Structurally the Beverley was quite conventional, although materials and dimensions had to be carefully studied to avoid unnecessary weight-penalties. The floor was one of the strongest yet fitted in an aircraft. Furthermore, all known precautions had been taken against fatigue troubles, the weight penalty involved being considered worth-while in view of subsequent economies in operation.

Discussing flying controls, Mr. Prower said that it was almost impossible to balance them sufficiently for the pilot to operate them without risking overbalance in certain flight conditions. Of the alternative of powered controls or a servo-tab system, the former were chosen because of the lack of experience in the latter at the time. "Feel" in the power system was provided by partial feed-back of control forces.

Performance figures were still subject to security, the lecturer said, but he was able to give estimates for the Universal, the Beverley's civil counterpart. The aircraft was designed for alternative loads and ranges (at a cruising speed of 185 m.p.h.) of 47,000 lb and 200 miles or 30,000 lb and 1,200 miles. By contrast many aircraft in use today were unable to make up their maximum a.u.w. with payload when carrying fuel for short ranges. The Universal was designed for operation from 1,350 yd unpaved runways, including all reserves for engine failure on take-off. Either 122 passengers, or freight in special pre-packed containers (reducing turn-round time) were envisaged.

In concluding, Mr. Prower hinted at further developments, particularly regarding the installation of different power-plants, and the fitting of a retractable undercarriage for economy over the longer stage-lengths.

Production. The next thirty minutes of the meeting were devoted to a paper by Mr. W. A. Hargreaves, works manager, on the production of the Beverley. In the short time allowed he proposed to deal only with the production planning phase of the programme as opposed to the actual construction side.

He described his task basically as the realization of the designer's ideas in the final production aircraft. In this process, he said, the whole design and production staff had to act as a team, from the designer to the test pilot; furthermore, the customer's requirements and criticisms had to be taken into account. "No ideas," he said, "have any real value until the result has been turned into an article which the customer is ready to buy, and at a price which he is willing to pay." Again, in view of the military side of the contract, it was not possible to mention any precise figures, and he would have to confine himself to an indication of trends and methods.

The basic principles of production could be enumerated as follows: (1) The production of any item called for four basic factors: men, materials, floor space and tools. (2) However complex, any product such as the Freighter could be broken down into a number of detailed items. (3) Details must be fabricated into sub-assemblies, then into assemblies, units and finished products, these processes being closely co-ordinated according to a strict timetable.

The first requirement in the planning stage of a contract was for a timetable for the assembly of all components, and for the integration of the timetable with the overall programme. This programme was determined by the intended rate of production in aircraft per month, the date of commencement of deliveries and the time taken to achieve peak production.

The lecturer's department had met with some difficulty in this respect because of the size of the aircraft; no effective comparison with schedules previously employed could be made. Experience with the first prototype was therefore used, together with figures from war-time production of Sunderlands. Comparisons led to

ANALYSING THE BEVERLEY . . .

first assumptions and eventually narrowed down to an assessment of the following: (1) Man-hours required to build the aircraft, taking into account decrease in man-hours with increase in experience of the work (run-down time). (2) Time taken to produce the first aircraft. (3) Time to reach peak production from completion of the first aircraft. (4) The build-up of labour to achieve (2) and (3), or the work in hand to achieve the programme.

An order for 250 aircraft at the Dumbarton factory during the war showed that, if 100 per cent was the total work required for that contract, then expenditure of work in hand of 8.8 per cent had been made just prior to the production of the first aircraft. This grew to 14.2 per cent by the time the output reached 10 per cent of the total. This figure was then steadily reduced as the contract drew to a close, and the requirement for fabricated parts for assembly diminished.

M.o.S. investigations had shown that run-down times averaged 85 per cent; that is, that each assembly took only 85 per cent of the time required for the previous sequence. Plotted on graphs, the run-down times for the Sunderland showed a steeper fall than those for the Freighter. This was because the Sunderland line had been tooled for a production of six aircraft per month—considerably higher than the Freighter. Mr. Hargreaves then showed the build-up of total man-weeks of productive labour on the Sunderland contract against the delivery of the first 25 aircraft. Actual deliveries had been none in the first year, two in the second, 44 in the third, 78 in the fourth and 81 in the fifth, including the introduction of a new type.

The amount of labour required to begin production, and the rate of increase of effort required to maintain the programme, were calculated and verified. It was then possible to turn to detailed planning of schedules. As the drawings came from the drawing office these schedules were worked out and the overall time required for assemblies established. Assembly timetables were so arranged that the components reached the line at the correct time.

Having arrived at the desired delivery time of components to the assembly line, each component timetable was calculated. Time in jig was decided from the number of jigs available. There finally emerged the complete pattern in time for the production and manufacture of all main components, their relationship with one another, and the final estimated time of completion and assembly. Thus the overall master planning was completed and the process of checking by weekly assessment began.

While this planning was being carried out during the first year, a survey was also made of the floor-space and machinery available, and of other factors related to the plant's ability to produce the aircraft. Lifting arrangements, layout of major jigs and the movement of components were studied. In the case of the Freighter, where space was limited owing to the size of the aircraft, a space model was made as a guide.

While the first year could be considered as the planning year, the second was for co-ordination of jigs and floor space, ready for production in the third year. At first, some effort might be devoted to parts not immediately required, but soon all effort had to be concentrated on those components with the longest assembly times. Early in the second phase, therefore, priorities must rank high in production plans. At all times the progress of each phase of production must be checked, with the object of achieving and maintaining the necessary balance.

Mr. Hargreaves questioned Henry Ford's statement that an "industrial process consists of passing raw materials through hands and machines," claiming that the process was in fact one of passing them through time with the accelerating effect of machinery. Elapsed time, he stated, was the greatest factor in any production programme.

The speaker concluded with a strong appeal for higher output at lower cost per unit. This, he maintained, was the only means by which the standards of living could ultimately be raised, and not, as was at present demanded, by increased wages. It was necessary to reduce the time taken to construct, thereby increasing output and reducing cost per unit; and this by the combined and wholehearted efforts of all sections of the industry.

Flight Testing. The final speaker at the meeting was Mr. G. R. I. Parker, assistant chief test pilot. He began by saying that the flight-test techniques for the Freighter were much the same as for any other piston-engined aircraft, though its size permitted the carriage of extensive recording equipment and of a number of flight-test observers.

"Sooner or later (and more often it is later)," he said, "there dawns the day when we have to find out if the aircraft will fly at all. With present-day design knowledge, it would be a great surprise to all concerned if the aircraft was not in such a state that it could be taken off, flown round and arrive back on the ground under reasonable controls."

The first flight, he continued, consisted mainly in achieving that performance, noting particularly the slow-speed handling qualities in the landing configuration, and the minimum safe approach speed. Subsequent tests were all aimed at establishing that the aircraft was pleasant, free from vices and functioned satisfactorily in all conditions, speeds and altitudes. Because, as soon as the machine flew, a great deal of interest was focused on it from all departments, it was important to complete flight tests in the shortest possible time.

Quantitative data were accumulated to substantiate qualitative results for the benefit of both the manufacturers and the customer. Special qualities, such as vibration, buffeting or noise, or the carriage of external stores or tanks, were also investigated. Mr. Parker enumerated the necessary tests as follows: *Preliminary tests:* (1) Air thermometer calibration—measurement of speed-correction coefficient; pressure-error measurement. *Performance:* Determination of best climbing speed; fuel consumption and range tests. *Handling:* Ground handling; take-off and landing; approach, landing and over-shooting; pilot's assessment of handling qualities; behaviour near and at the stall; behaviour at high indicated air speed; handling with one or more engines throttled; longitudinal stability and control; longitudinal manœuvrability; lateral and directional trim, stability and control; acceptable limits of c.g. range. *Cooling:* Engine; oil; auxiliaries. *Systems:* Fuel; hydraulic; electrical; pneumatic. *Comfort:* CO contamination; noise; heating and ventilation; vibration.

All early tests were aimed a finding unsatisfactory characteristics as soon as possible. Remedies could then be applied before subsequent detailed tests could be affected. Early tests, therefore, covered a wide range, but were not very detailed. When the aircraft was as nearly as possible in its final form, the proving tests providing the main quantitative data were begun.

The initial and proving stages often unavoidably overlapped, but, according to the ultimate rôle of the aircraft, a schedule was planned. This evolved from the results of early tests and also from the qualitative assessment of the test pilot. Mr. Parker spoke of the responsibility of the test pilot upon whom smooth development largely depended, and by whom undesirable features were normally first noticed. When he noticed a defect, the instrumentation and devices (such as wool tufting) established its nature, and sometimes indicated the remedy.

Since a large number of quantities had to be measured and recorded by instrumentation, the necessary equipment had to be planned and designed into the prototype. Items to be recorded at chosen intervals in flight during all tests included air speed, height, r.p.m., boost, weight, and time, and the position of cooler shutters and of main flaps. During handling tests, it was further required to record elevator, aileron and rudder angles, and those of their respective trim-tabs; forces and hinge moments of the three controls; angle of yaw, bank and pitch; and rate of roll and normal acceleration. During performance tests, fuel flow, position error, air temperature, and torque were measured.

Angular displacement of controls, control forces and angles of yaw were normally measured by Desynn transmitters. The weight of the aircraft was established during each recording sequence according to the fuel state. Normal acceleration was measured by the Kollsman accelerometer. The total weight of test equipment in the Freighter was approximately 3,200 lb.

Even an aircraft such as the Freighter, capable of carrying many observers, required automatic recorders, either of the photographic or trace-recording type. Still or motion cameras were used, and adequate lighting and anti-vibration mounting of instrument panels was required.

As for flight-test planning, the lecturer said that no prototype progressed smoothly, for there were a number of unavoidable interruptions, such as S.B.A.C. Shows and demonstration flights. Early in its life, however, an aircraft should be flown at the forward and aft c.g. limits, and its longtitudinal stability and manœuvrability determined over the full speed range and in various flight conditions. Early in the programme, too, came control characteristics, these being initially checked qualitatively in search of snags: side-slips were carried out to determine any tendency to overbalance in the rudder. Stalling, flaps up and down, was also fairly thoroughly investigated, to establish the nature of the warning. Implicit in these initial tests were checks of trim changes, engine cooling, and the functioning of the various services. On the Freighter, tests with the rear doors removed were carried out early in the programme to determine effects on stability, drag and the CO contamination.

Each test flight should be planned to take the best advantage of airborne time in so far as weather conditions permitted. It was possible to obtain several test recordings in one flight condition; cooling and performance tests, for example, were normally combined.

The total time required for the test programme varied with aircraft size, weather, the extent of trouble encountered, the availability of hangarage for maintenance, and other secondary factors connected with the company's own facilities. For an aircraft such as the Freighter, 18 months to two years, with a flying time of 200 to 250 hours, was considered normal.

Methods of testing employed by the firm's pilots were identical

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ANALYSING THE BEVERLEY . . .

with those of the A. and A.E.E. It was in fact usual, with aircraft built to M.o.S. specifications, for the makers' preliminary tests to be exactly duplicated by those of the Experimental Establishment during acceptance trials. This duplication was necessary to ensure the desired standards, but it was undoubtedly uneconomic. After these two initial phases, the prototype was granted limited flight-approval, implying that quantitative results obtained by the firm were accepted. Thereafter, Brough test recordings were assessed independently by the A. and A.E.E., and the latter's pilots flew the prototype and expressed their criticisms.

As an example of test procedures, Mr. Parker described the tests employed to determine the longitudinal manœvrability characteristics of an aircraft in detail. These, he said, were obtained by measuring the stick force per g, which was confined within fairly narrow limits; the lower limit for safety considerations should not render it too easy to impose a breaking strain on the airframe, and the higher limits should be acceptable from the controllability point of view. Four kinds of test were made with the object of measuring: (1) steady stick force per g in recovery; (2) peak stick force per g in recovery; (3) stick force and normal acceleration in turns; (4) stick force in out-of-trim flight and normal acceleration on release of the stick. The most reliable assessments were provided by steady stick force per g tests. Measurements in turns and out-of-trim flight were not so comprehensive, and were considered to be supplementary.

Test equipment required included: in the cockpit, a Desynn-type stick-force transmitter, a visual accelerometer, and a test A.S.I.; and, elsewhere, an automatic observer to give continuous records of stick force, air speed and normal acceleration, as well as height, flight-path and elevator and elevator-trimmer angles.

Tests were normally carried out in the forward and aft c.g. positions, but were sometimes also required for intermediate positions. The a.u.w. of the aircraft should be the same for all c.g. loadings, and the weight and c.g. position at each observation should be calculated from the fuel used and the time.

All the tests were carried out at low altitude and, except for the turn tests with undercarriage and flaps down, were repeated near the aircraft ceiling. The recovery tests were made at maximum continuous power over the speed range from best climbing speed to maximum permissible speed at 20 to 40 kt. intervals. Engine-off tests were then made to determine the effect of power setting. Turning tests were made under climbing, slow cruising, and combat conditions and also at approach-power settings.

Having thus outlined the principal procedures and requirements for flight testing, Mr. Parker concluded by remarking that the prototype inevitably spent the greater part of its time on the ground for one reason or another. Weather conditions could not be overcome by the installation of extensive radio aids, since most tests required smooth air and aircraft such as the Freighter were naturally unable to climb above the weather. He stated, however, that, despite its size, the Freighter was uncomplicated; it could be flown by one pilot, if necessary, though two were normally carried. Like all prototypes, it had had its various troubles, but at no period had it been difficult to cope with, or unsafe. The fact that development had not gone as rapidly as could have been wished was mainly due to reasons beyond the company's control.

[The prototype Beverley is now engaged on heavy dropping trials north of Amesbury. Blackburn's test pilots H. "Tim" Wood and G. R. I. "Sailor" Parker, are doing the flying and the aircraft takes on its loads—which on Monday last included two vehicles—from Boscombe Down. Dropping heights have been less than 1,000ft and the speed around 120 kt.—Ed.]

HYLUMINA—A NEW CERAMIC

THE bald fact that K.L.G. Sparking Plugs, Ltd., have developed a new insulating material for aero-engine sparking plugs does not appear, on the face of it, to have unusual significance. But with a little of the background filled in, this particular development stands out as one of great importance, and as an excellent example of the ceaseless "back-room" work which precedes the development of any new material. This insulator can fairly claim to represent the greatest single advance in its field since before the war; and it is entirely British.

Apart from the obvious requirement of poor electrical conduction under all conditions, a plug insulator must be highly resistant to thermal shock and to tetra-ethyl-lead corrosion, have good heat conduction and considerable mechanical strength.

Mica was the accepted insulator before the war, but its poor resistance to leaded-fuel corrosion started the search for better materials. Following German experiments, K.L.G. produced a ceramic which, with modifications, was used throughout the war. Briefly, it was composed of a crystallized mineral, corundum, fired at high temperature with a "cement" bonding. Although quite adequate for its original purpose, this material had limitations which prompted further development in 1941. After extensive research it was agreed that alumina (aluminium oxide, Al_2O_3) was virtually the perfect material; unfortunately its use involved unacceptable production penalties in both cost and time. What was required was a compound of alumina which could be readily "worked," while retaining the excellent properties of the pure material.

By 1948 a new material had been evolved, composed of about 95 per cent fine-grained alumina, a bonding agent, and rather less than 3 per cent silica. The material was designated S.749, for it was the result of 749 experiments, some very extensive.

The advent of gas turbines accelerated development for, contrary to the practice followed in the early Whittle engines, working pressures and temperatures increased rapidly, the latter parameter becoming more severe than had been met in piston engines. From 1948 the new material, named Hylumina, was put through the necessarily lengthy and exhaustive manufacturer's tests—first on single-cylinder piston engines and then gradually working up to flight clearance (after at least 25,000 hours) and, eventually, A.R.B. or M.o.S. clearance. With the co-operation of Bristol and Rolls-Royce, the following plug assembly was developed: Hylumina insulators, a silver core fused to the platinum centre firing point, twin earth electrodes of platinum alloy, a resistor (1,000 to 3,000 ohms) and completely gas-tight joints between the insulators and all metal parts.

To make a Hylumina insulator, the finely screened ingredients are damped and press-formed in moulds. The rough cast is then shaped with a tipped tool, after which it is passed slowly through a gas furnace (26½ hours at 1,600 deg C) and cooled. Now a pale blue, the insulators are checked optically for flaws and a sample batch from each firing is subjected to a thermal-shock test and compressive tests to destruction. These tests take the following form: a plug is coated with a reddish-purple dye and its nose dipped in molten tin, the temperature of which is raised in 25 deg C steps from 600 to 950 deg C. If the insulator cracks, the dye runs into the split to render the fault obvious. The compression test-load is applied transversely across the widest part of the insulator; the eventual fracture always runs roughly parallel to the major axis of the plug.

Aircraft piston-engine sparking plugs are now in full production by K.L.G. with insulators of Hylumina. For Bristol sleeve-valve engines a special range of plugs is being made, embodying —among other modifications—a bell-mouth end to the plug body, which assists scavenging and also reduces the possibility of oiling-up during long, gentle "airline" let-downs.

The special qualities of Hylumina soon caused its adoption in the manufacture of gas-turbine equipment. On many of the largest turbojets the igniter plugs and re-heat igniters, the latter having to withstand operational temperatures exceeding 700 deg C, are now embodying Hylumina insulators. In addition, the new insulator is being used on a jet-pipe thermocouple developed for Armstrong Siddeley, Bristol and Rolls-Royce engines.

An interesting sidelight on the hardness of Hylumina is provided by the ready acceptance of the material for tipping machine-tool bits. Hylumina tool-bits are becoming widely used in the turning of certain plastics, in which a high resistance to abrasion is of paramount importance.

K.L.G. consider that Hylumina provides the answer to most insulation problems for plugs and igniters for some time to come; but development is continuing to make certain that a still more advanced ceramic is available when required. It should be added that the aviation equipment manufactured by the K.L.G. company is marketed by Smiths Aircraft Instruments, Ltd., of Cricklewood, London, N.W.2, to whom enquiries regarding the new material should be addressed.

CANADA'S PRODUCTION YEAR

IN 1953, for the first time, the Canadian aircraft industry built more jet aircraft than piston-engined types. The Air Industries and Transport Associations said recently that the industry delivered nearly 1,000 military aircraft last year, to a value of about $300m. Most of them went to the R.C.A.F. but some were exported to the United States and Britain.

The swing to jet production resulted from increased output of the CF-100 and the beginning of deliveries of the T-33 trainer for the R.C.A.F. There was a "fairly steady" output of F-86s, the bulk of which were supplied to the R.A.F. and U.S.A.F.

Almost the entire military production of piston-engined types —Harvards and D.H. Beavers—went to the United States. The Canadian Car and Foundry Co., will soon turn out their last Harvard, then begin construction of the Beech T-34 for the U.S.A.F.

AIRCRAFT INTELLIGENCE

CONVERTIPLANE: First photograph of the McDonnell XV-1 convertiplane at St. Louis, where the type is under development for the U.S.A.F. The power unit(s), fed from the flank air-intakes supply compressed air to the rotor for vertical take-off and hovering; in full flight the rotor is autorotated and the machine is propelled by the propeller and sustained by the rotor and fixed wing. The maximum speed should be at least 160 m.p.h. A four-seater, it weighs about 5,000 lb.

Great Britain

D. H. Dove Marks. For the record, the following are the principal Dove Series. Dove 1, standard 8/11-seater with Queen 70 Mk 1 engines; Srs. 2, special executive version of Srs. 1; Srs. 3, an experimental turboprop version which was abandoned in the design stage; Srs. 4, military version, i.e. Devon; Srs. 5, standard 8/11-seat transport with more powerful Queen 70 Mk 2 engines; and Srs. 6, executive Srs. 5. The Dove 2A and 6A are aircraft destined for the American market, and they have certain minor differences in equipment.

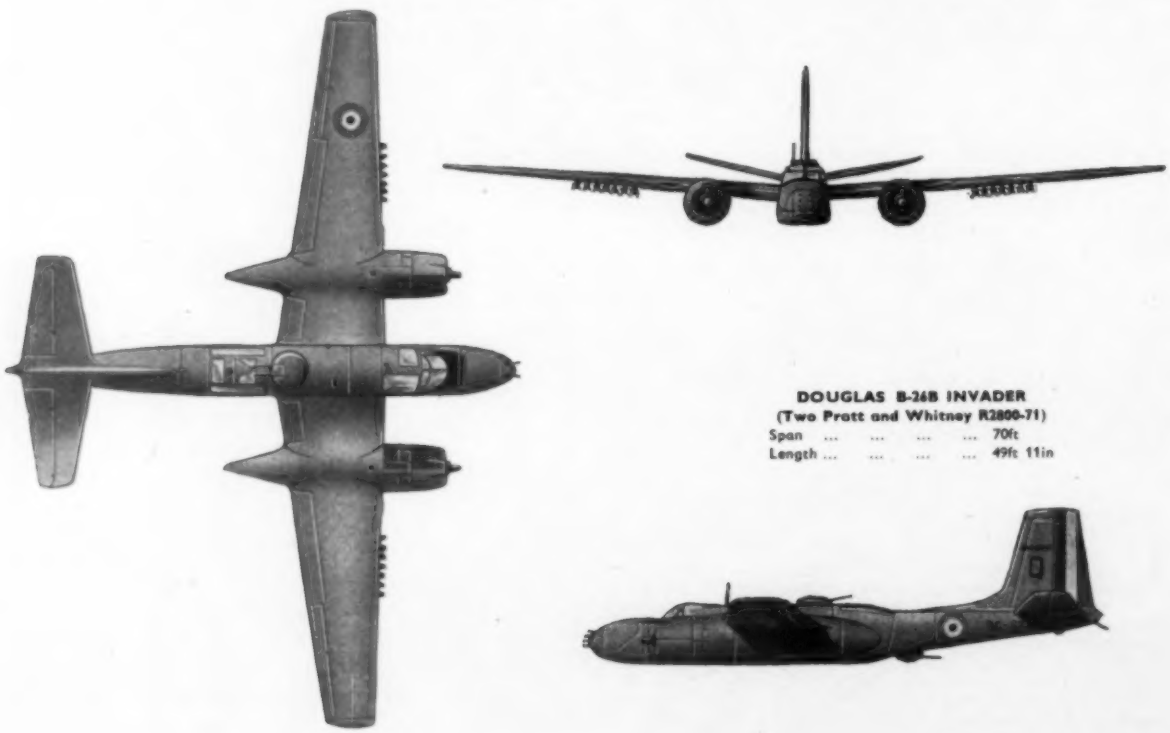
Civil Registrations. The following are some of the more interesting of the recent allocations in the latest *Register of British Civil Aircraft:* G-AMYK, Britannia 200; YL, Britannia 300; G-ANGK, Britannia 250; G-ANFH, JS, JT, JU, JV, Westland-Sikorsky S.55s; G-ANLO, Comet 3 prototype. The register also shows that all B.E.A.'s Viscount 701s are now licensed to operate at 57,000 lb, while the 700 prototype is held at 51,000 (though special clearance at 60,000 lb was given for the New Zealand race). Comet 1s have for some months been cleared at 107,000 lb, exceptions being G-ALZK (M.o.S. prototype) at 105,000 lb and the Comet 2X (Avon 502s) with a special category certificate at 108,000. The production Comet 2s are not yet certificated, but this should not be long delayed and should permit operation at 120,000 lb from the start.

United States

Douglas B-26 Invader. Although of World War II vintage, this fine multi-purpose aircraft is still to be found in first line service with many air forces, navies and other operators, as well as in the employment of numerous American companies in civil guise. Even the U.S.A.F. has squadrons at combat readiness in France, and they will remain there until an aircraft can be found capable of replacing them (this will be, of course, the Martin B-57A Canberra). In Indo-China, the French Air Force is employing the Invader as its principal bomber and strike aircraft, and one of these is the subject of this week's three-view drawing. The two-seat B-26B is the "solid-nose" strafer; the bomb-sight-equipped B-26C has a crew of three.

Lockheed Neptune. The fitting of Westinghouse J34 turbojets under the wings of these U.S. Navy patrol bombers is by no means a "one-off" experiment. Designated P2V-7, aircraft so equipped are in full production at Burbank under a new Navy contract. The 3,600lb-thrust J34s are mounted in pods which reduce the number of external stores racks. With both Turbo-Compounds feathered, the P2V-7 can maintain about 200 m.p.h. All P2V-7s have the "stinger" tail, housing a search magnetometer.

Lockheed Trainer. Illustrated on another page is the experimental/demonstration trainer developed by Lockheed from the standard T-33. Obvious modifications include the "grandstand seat" for the instructor, who now sits about 18in higher than his pupil; this reflects British practice with our dual-control fighter conversions of the late 1940s. To reduce the stalling speed, and improve low-speed lateral control, the wing is fitted with slats. Another addition is a braking parachute. This aircraft has civil registration.



DOUGLAS B-26B INVADER
(Two Pratt and Whitney R2800-71)

Span	70ft
Length	49ft 11in

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The Alvis Leonides — 550 b.h.p. 9-cylinder air-cooled radial engine. Weight complete 796 lb. Power/weight ratio 1·45 lb. (0·657 kg.) per b.h.p. Overall diameter 41·5 in. (105 cm.). In quantity production for the Royal Navy, the Royal Air Force and Commercial Operators.

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BREAKING PORT: A lone Sea Hawk of 898 Squadron heads for its Pembrokeshire home.

SEA HAWKS

Fleet Fighters at Brawdy

By H. F. KING, M.B.E.

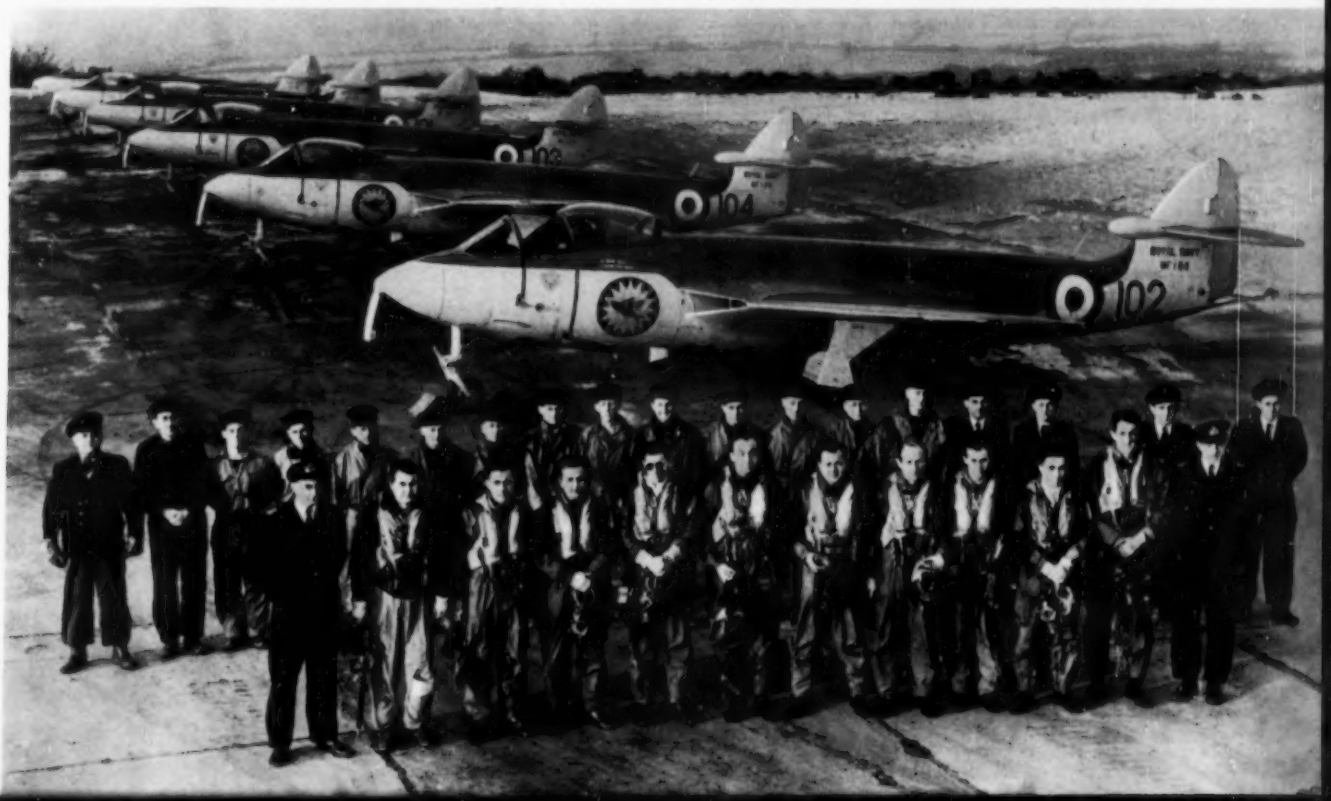
IT seems that the first British fighter to be flown from the deck of an aircraft carrier was a Bristol Scout. The date was November 3rd, 1915, the ship H.M.S. *Vindex*, and the Scout pilot F/L. H. F. Towler. *Vindex* was formerly the Isle of Man passenger steamer *Viking* and as a warship she carried two of the tiny Bristols dismantled in her forward hangar. They took the air from a special "flying-off" deck.

A little later, Sopwith Baby floatplanes, with "fall-away" wheels, were launched from the deck of H.M.S. *Campania*; but these Tabloid developments proved ineffective against the Zeppelins they were intended to destroy, and experiments were put in hand with Sopwith Pups fitted with plain wheel-undercarriages. Subsequent development of the ship's Pup was described by J. M. Bruce in *Flight* of January 1st this year.

A most significent achievement was the first deck landing on a British aircraft carrier, by Sqn. Cdr. E. H. Dunning on August 2nd, 1917. The space available was the 228ft forward deck of H.M.S. *Furious* and Dunning had to "crab" his Pup over the deck centreline, whereupon it was hauled on to the deck by means of rope toggles. He repeated the feat once but was killed in a third attempt.

From the ship's Pup Beardmores developed the "foldable" S.B.3D, but this was quite outperformed by the R.N.A.S. version of the Sopwith Camel (Type 2F.1). In 1921 the Camel itself was declared obsolete and was supplanted by the Gloucestershire/Nieuport Nightjar, or Mars X, of 1922. Something of a *rara avis*, the Nightjar was the last British operational aircraft to have a rotary engine and soon gave place to the Fairey Flycatcher. Pert, noisy, and well loved, the little 'Catcher held the deck for nearly ten years, until the Hawker Nimrod came in about 1931. First cousin of the Fury shore-based intercepter, this Kestrel-engined

On a winter's morning at Brawdy the officers of No. 898 Squadron, with the chief and petty officers, pilots' mates and men of the Squadron Servicing Unit, present themselves before "Flight" photographer L. W. McLaren. From left to right, the officers are: Lt.(E) M. H. Hall, air engineer officer; Lt. W. R. Dillen, U.S.N.; Lt. N. R. Williams; Act. S/Lt. P. J. Swain; Lt. F. W. S. Grant; the C.O.—Lt. Cdr. D. G. Parker, D.S.O., D.S.C., A.F.C.; Lt. D. B. Morison, senior pilot; Lt. D. P. W. Kelly; Lt. J. L. Newns; Act. S/Lt. E. A. Shortell; Lt. P. L. Hort; Lt.(L) I. A. McLellan, air electrical officer.



Seen against the grandeur of earth, sea and sky, and lit by a winter sun, the Sea Hawks take on a new beauty.

Sea Hawks . . .

biplane was officially classified as a single-seater fleet fighter shipplane; a companion type, developed from the Hart day bomber, was the Osprey two-seater fleet fighter reconnaissance shipplane. After the Nimrod no other type of single-seat fleet fighter was adopted until the Gloster Sea Gladiator of 1939—the last fighter biplane in British service. There followed the Blackburn Roc two-seater, a development of the Skua fighter/dive-bomber, with four turreted guns, and the Fairey Fulmar, another two-seater but with its eight fixed guns concentrated in the wings. The Hawker Sea Hurricane and Supermarine Seafire—war-time single-seaters which served alongside the American Wildcat, Hellcat and Corsair—are so freshly remembered as to need no panegyric. As for the Fulmar's successor, the Firefly cannon-armed fixed-gun two-seater, it is still going strong in Naval service, though no longer in fighter guise.

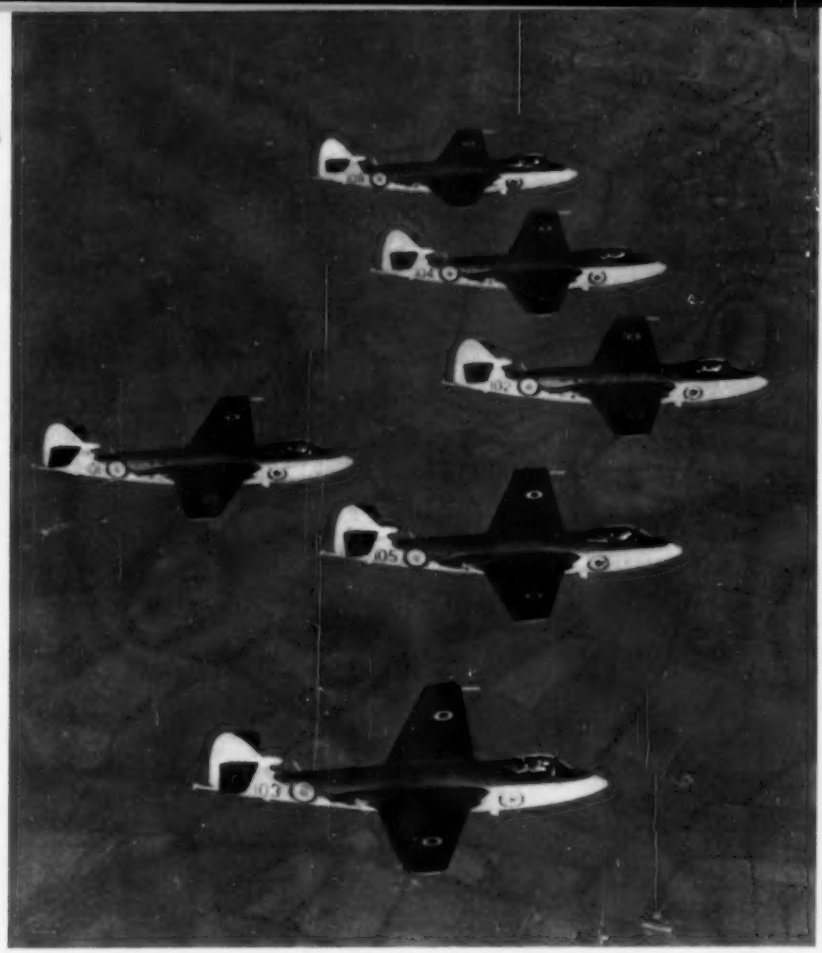
The war being ended, de Havillands entered the picture with their twin-Merlin Sea Hornet single-seater and two-seater, while in replacement of the Seafire came the Centaurus-powered Hawker Sea Fury, famed for its deeds in Korea.

First of the Navy's jet fighters was another de Havilland, the Sea Vampire, but few were ordered and the first truly operational jet squadrons were equipped with the Nene-engined Supermarine Attacker. Like all standard British Naval single-seaters including, and subsequent to, the Seafire, the Attacker is capable of striking ground or surface targets with rocket projectiles or sizeable bombs, in addition to functioning as a fleet-defence intercepter. Similarly powered, the later and generally more efficient Hawker Sea Hawk has stolen the naval-fighter picture in recent months and is the subject of our story.

To complete our introductory sketch we may remark that the two-seater day-and-night fighter D.H. Sea Venom is now appearing in numbers to take over from the two-seater Sea Hornet, and will in due time be succeeded by a development of the D.H. 110. Successor-apparent to the Sea Hawk is a swept-wing twin-jet Supermarine, developed from the Types 508 and 529, the world's most powerful naval intercepters.

One reason for introducing our story with the foregoing résumé is to show that, of fifteen types of British single-seat naval fighter put into service, no fewer than seven have been of Sopwith or Hawker design (or eight, if one includes the S.B.3D). Two others were products of the Gloster company—now, of course, a member of the great Hawker Siddeley Group.

So the Sea Hawk is a descendant of the earliest naval fighters.



Whether flying in a vic of five with the sixth man "in the box" (above), or in echelon (below) the Sea Hawks look the part; and their pilots are worthy of them.

Illustrated with "Flight" photographs

A Sea Hawk comes in for an ADDL (airfield dummy deck landing).

Sea Hawks . . .

Technical Background: The basic design—prepared under the supervision of Sydney (now Sir Sydney) Camm—dates from 1944, at which time the project was known as the P.1040. In December, 1945, the Royal Navy invited a tender for a similar machine, to serve as a carrier-borne intercepter; this having been submitted in January, 1946, an order was placed a month later for three prototypes and one structural-test example. At this stage the specification number N.7/46 was initiated.

The P.1040, serial-numbered VP401, first flew on September 2nd, 1947, and was eventually equipped as a test-bed for the Armstrong Siddeley Snarler rocket motor, under the designation P.1072. The first N.7/46 (VP413) flew on August 31st, 1948, and the second (VP422) in 1949. In November, 1951, there followed WF143—a production-type Sea Hawk, with span extended from 36ft 6in to 39ft, a revised cockpit hood and other refinements.

During 1952 an arrangement was made, in agreement with the Ministry of Supply, for Hawker production of the Sea Hawk to cease with the end of the contract then in hand, by which time aircraft built by Armstrong Whitworth would be forthcoming. Later it was decided that increased Hunter production at Hawkers was so urgent that the complete transfer of Sea Hawk production must take place without further delay, and by August, 1952, jigs and parts were on the road to Armstrong Whitworth. The first Baginton-assembled Sea Hawk—WF162—emerged early last year, and at about the same time it was made known that a 13-million-dollar (£4.6 m) NATO "off-shore" contract for more than 100 similar machines had been awarded.

The Sea Hawk F.1 is the prettiest fighter ever to grace a deck and certainly among the deadliest. Design features were described and discussed at length, and illustrated in great detail, in *Flight* of November 10th, 1949, but brief recapitulation is now in order. The mid-mounted wing is of 39ft span. The front and rear spars of the inner sections are arched round the engine bay and, being integral with the centre portion of the fuselage, result in a notably smooth blending of the wing and body. The outer panels have front and rear spars and a heavy-gauge skin covering; they are attached to the stub wings by two hinge fittings with automatic locks and a spigot bearing in the leading edge. In conformity with modern practice, they are power-folded upwards, thereby reducing the width to 13ft 4in.

The flying controls operate through a push/pull rod system and all the control surfaces are covered with pre-tensioned skin. Spring tabs in the ailerons maintain lightness at high speeds. The air brakes consist of split trailing-edge flaps, the lower surfaces of which also act as normal split flaps for landing and take-off. Whereas the lower portions are in three sections and extend from the aileron to a point beneath the fuselage, the upper sections extend inboard only as far as the folding hinge. Ample flap area is, of course, a prerequisite on a carrier-borne fighter, and on the Sea Hawk the total is 50 sq ft—representing a large proportion of the gross wing-area (278 sq ft). Slightly ahead of the main spar, in the stub-wing under-surfaces, are dive-recovery flaps of about 26in span.

The nose and centre portions of the fuselage are of semi-monocoque construction, reinforced by a box-section keel member and four longerons, but the rear fuselage is a pure monocoque structure, with the fin base built integrally. Each of the three undercarriage units has a Dowty liquid-spring shock-absorber.

In the stub-wing leading edges are the air intakes for the Rolls-Royce Nene turbojet, discharging at low velocity into a plenum chamber, and immediately aft of the turbine the jet-pipe is bifurcated, the twin outlets being carefully faired-in aft of the

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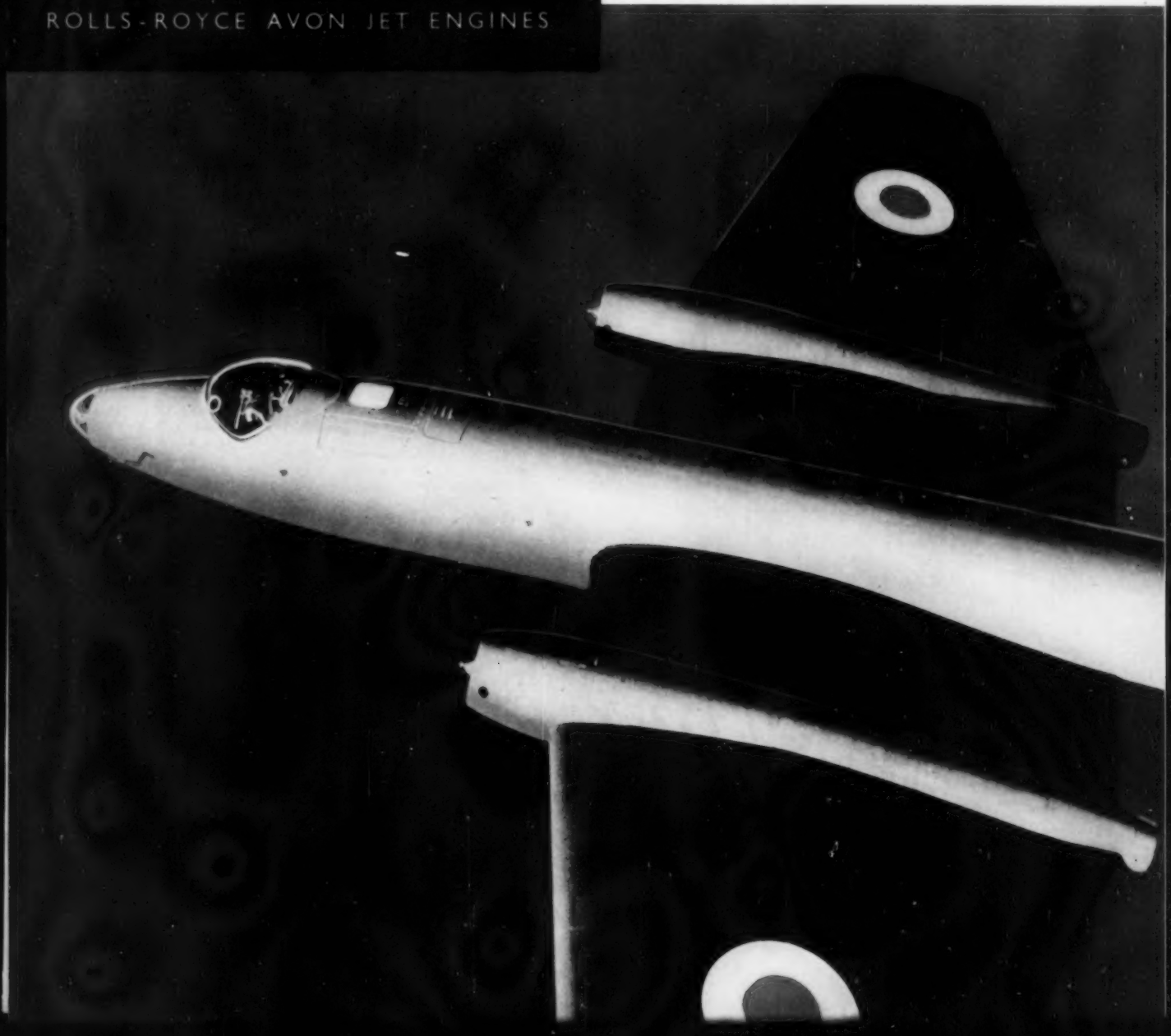

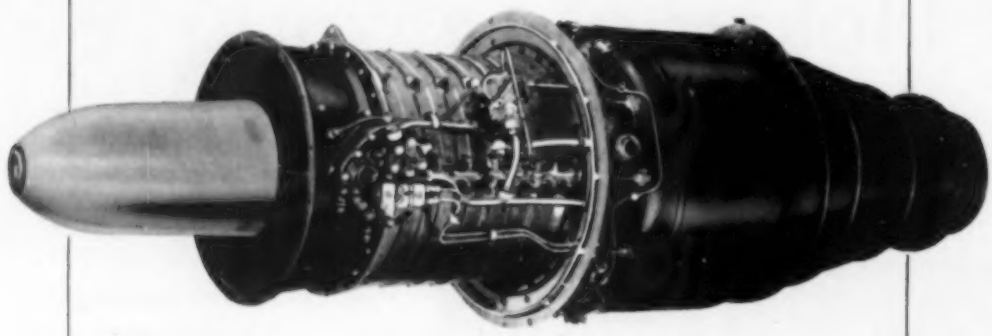

Variations . . . long life or short life

The Viper turbojet is now being developed in two forms, 'short life' for the Australian Jindivik pilotless target aircraft, and 'long life' for the Percival Jet-Provost Trainer for the Royal Air Force. The 'short life' version — the Viper ASV3 — has been type tested and is in production at 1,640 lb. thrust. Development to higher performance is proceeding. The 'long life' engine for training aircraft — the Viper ASV5 — also develops 1,640 lb. thrust, and this highly efficient and simple power unit will have a very long overhaul life. A licence agreement with Avions Marcel Dassault of Paris for the manufacture and development of the Viper is now in operation.

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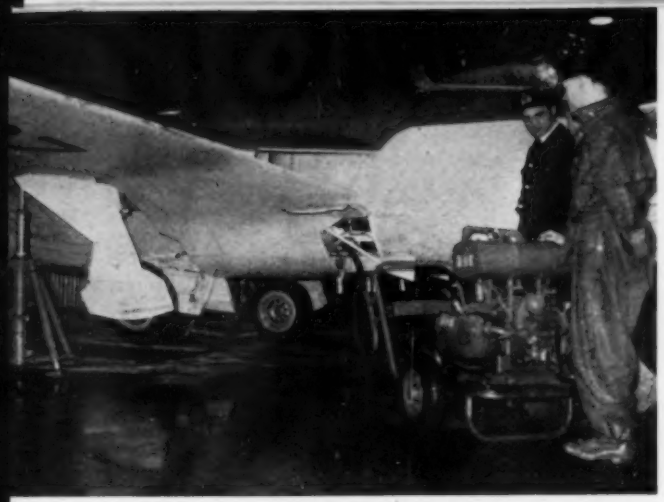


Lt. (E) M. H. Hall, air engineer officer of 898 Squadron, supervises an undercarriage-retraction test. The picture also shows how smoothly the Sea Hawk wing merges with the fuselage.

Sea Hawks . . .

trailing edge. It is a Hawker claim that this arrangement greatly reduces the frictional loss associated with long intake and exhaust systems, and at the same time affords valuable space for equipment and tankage fore and aft of the engine. The pressurized cockpit is equipped with oxygen, heating, ventilating, windscreen de-icing and fire-extinguishing systems, and a Martin-Baker automatic-ejector seat. The spacious canopy can be jettisoned in conjunction with the seat or by itself.

Four 20 mm Hispano-Suiza guns are mounted in the lower portion of the fuselage, aft of the seat. The present Sea Hawk F.1 is not equipped to carry bombs or rocket projectiles, though provision for external armament stores will be made in the Mk 3 variant. Under-wing pylon-mounted tanks are already in use.

Sea Hawks in Service: The first Sea Hawks squadron was No. 806, formed last spring at H.M.S. *Goldcrest* (Brawdy, Pembrokeshire), under the command of Lt.Cdr. P. C. S. Chilton, R.N. A series of superb flying demonstrations quickly spread the fame of the unit, and the C.O. explained at the time that these were made possible so soon after forming because the pilots were already highly proficient in the aerobatic art and because the Sea Hawk was "a pilot's aircraft." Much and widely was 806 envied its dainty, glossy new fighters. Emblazoned with the Ace of Diamonds insignia, they made a vivid flash of colour at the Royal Fleet Review at Spithead on June 15th, flying in company with prototype Sea Venoms at the rear of the historic fly-past.

On August 24th last a second Sea Hawk squadron—No. 898—began to form at Brawdy, and to see how it was progressing in its "work-up" at that bleak and distance base we set out early this new year.

Brawdy, as we have said, is in Pembrokeshire. Eleven miles of angular and elementary road stretch between the airfield and the nearest railway station, at Haverfordwest. Brawdy village is the merest sprinkling of houses and a chapel, and lies inland from the plateau upon which the airfield is built. This knowledge we had second-hand, for we saw nothing of man-made or natural features as the "'tilley" bore us from Haverfordwest in the blackness of a bitter night.

The ministrations of a small company of officers lingering in the wardroom soon enabled us to forget the rigours of the journey, and ultimately we were conducted by flashlight, instinct and dead reckoning to our sleeping quarters. The rudimentary nature of this accommodation was relieved by a quite magnificent soiled-linen basket; and, pondering on this incongruity, we fell asleep.

At a respectable hour next morning we presented ourselves before the Commanding Officer of the station, Capt. R. E. N. Kearney, O.B.E., and proceeded to draw upon his unrivalled knowledge of H.M.S. *Goldcrest*. The airfield, he told us, was built for the R.A.F. during the late war and was an important base for Coastal Command Liberators. Its "weather factor" (in the parlance of the initiated) is good, and the approaches perhaps the best in the country—by which we understood Great Britain.

Though still incomplete, the airfield was commissioned as a Royal Naval Air Station on September 4th, 1952. Runway re-surfacing was then in hand and parts of the perimeter tracks remained to be concreted. The temporary R.A.F. buildings, dating from about 1942, were not in a good state and considerable work was necessary to make them habitable. By November that year the airfield was usable, though even then lighting equipment was still being installed. Work on this was completed the following spring.

As now in use the airfield has three runways, two of 2,000yd and one of about 1,400yd, arranged in a broad arrow. Lighting is complete and night flying is frequent, for the Navy's fighter pilots must familiarize themselves with the darkness; it might be necessary, for instance, to catapult their aircraft from a carrier before dawn in order that they might be in position at first light.

The present development programme is an extensive one, calling for permanent living accommodation and greatly increased hangarage and technical facilities. A good deal of effort is being directed also to the preparation of armament training ranges at Castle Martin (army support), and St. Bride's Bay (air-to-sea). Castle Martin is being provided with sections of armour plate and hit recorders, a couple of disused tanks, and bombing circles. A third range at Talbenny (a deserted airfield near Dale) has circles for practice dive-bombing. No release takes place here, but the angle of dive is checked and the result assessed by means of the ciné-camera.

The first Naval squadron to move into Brawdy was No. 804, equipped with Hawker Sea Furies. Eventually this unit was embarked in H.M.S. *Theseus* and left for the Mediterranean, whence it has not yet returned. Nos. 806 and 898 (Sea Hawk) Squadrons, formed, as already noted, last year. Brawdy also has a Station Flight (Lt.Cdr. E. Dixon-Child) equipped with two Gloster Meteor 7 trainers, two Westland-Sikorsky Dragonfly helicopters, a Hawker Sea Fury Trainer and a de Havilland Dominie. The Meteors and Sea Fury Trainer afford flying practice for the station pilots and simulated instrument-flying practice for the squadron pilots; the Dragonflies serve for search and rescue; and the Dominie for communications. Eventually the Meteors will be employed as tugs for winged and banner targets.

Happily the services of the Dragonflies are seldom in demand, though on two occasions they have been urgently required by the R.A.F. Practice rescues of Naval pilots from their dinghies are big attractions for holiday-makers in the summer months—which reminds us that last year the Brawdy "At Home" drew about 10,000 visitors, a great number of them from remote parts. This year the Captain expects about half as many again, and we predict that they will be well rewarded.

In passing it may be remarked that some seven miles from Brawdy, near the tiny cathedral city of St. Davids, is an airfield which is operated by Airwork, Ltd., on behalf of the Admiralty, and which comes under the direction of H.M.S. *Goldcrest*. Its two principal commitments are a "heavy twin" conversion course on Mosquitoes and a jet-conversion course on Meteor 7s. Night flying is done from Brawdy, since St. Davids has no adequate night-flying facilities.

Commander F. A. Swanton, D.S.O., D.S.C. and bar, is Brawdy's Commander (Air), and in that capacity he is responsible to the Captain for all flying on the station (especially for the exercising of the squadrons in accordance with the work-up programme laid down by the Admiralty), and for the safety organization. His "Number Two" is the Lieutenant Commander (Flying), Lt.Cdr. W. F. Rogers, who co-ordinates the various exercises and lays down the week's flying programme. The Executive Commander is Cdr. D. Cameron, V.C., and the Air Engineer Officer Cdr. (E) P. S. Wilson, A.F.C.

No. 898 Squadron is commanded by one of the most distinguished of all Fleet Air Arm officers, in the person of Lt.Cdr. D. G. Parker, D.S.O., D.S.C., A.F.C., who has as his senior pilot Lt. D. B. Morison. The duties of this last-named officer are diverse and exacting. As second-in-command of the squadron he is responsible to the C.O. for the running of the flying programme; for flying discipline and training; for briefing; for the recording of flying hours, exercises completed, and so forth; and for co-operating with the engineer officer to ensure that serviceability is

Capt. R. E. N. Kearney, O.B.E., who commands H.M.S. "Goldcrest" (Royal Naval Air Station Brawdy), where the first Sea Hawk squadron—No. 806—was based before going aboard H.M.S. "Eagle" recently, and where No. 898 Squadron is now working up, as here described.

Sea Hawks . . .

maintained at the highest possible pitch. He keeps the pilots up-to-date on such matters as flying hazards and prohibited areas; supervises their ground training and dinghy drill; and ensures that new arrivals know their cockpit drill. And he sees to it that they are acquainted with the history of their unit, which it is now appropriate to sketch for ourselves.

The squadron formed at Lee-on-Solent on September 15th, 1942, and since the initial equipment was to be six Grumman Wildcats, it was arranged that the working-up programme should be conducted in America. Under the command of Capt. A. J. Wright, R.M., the squadron sailed for New York in R.M.S. *Queen Mary* on October 7th. From New York it moved on to Quonset Point, where the Wildcats were collected and flying started. By the end of the year the original complement of six pilots was increased to twelve, and when the squadron moved to Norfolk, Virginia, command was assumed by Lt. (A) Ivan L. F. Lowe, D.S.C., R.N. At the new base the work-up went ahead and during January, 1943, deck-landing training was carried out in U.S.S. *Charger*. On February 2nd the squadron was embarked in H.M.S. *Victorious*, which thereupon sailed through the Panama Canal to join the United States Pacific Fleet. During the next six months, while the Fleet was patrolling the Coral Sea and the south-west and mid-Pacific areas, the Wildcats saw action against the Japanese.

In the autumn of 1943 H.M.S. *Victorious* returned to the United Kingdom and the squadron disembarked to R.N. Air Station Eglinton, where it became part of No. 7 Fighter Wing. At this time the wing leader was Lt.Cdr. M. F. Fell (now Commander (Air) at R.N.A.S. Ford) and Lt.Cdr. R. Henderson, R.N.V.R., commanded the squadron.

Soon the Wing embarked in the escort carrier H.M.S. *Searcher*, transferring later to H.M.S. *Fencer*—a unit in the North Sea force. On April 3rd, 1944, its aircraft were engaged in the attack on the German battleship *Tirpitz* in Alten Fiord, Norway, and during the following two months they put in numerous strikes against shipping off Norway. Four Bv 138s and one Fw 200 were destroyed by pilots of "898" and for their part in the operations the commanding officer and senior pilot were awarded the D.S.C. The wing leader received the D.S.O. and two other pilots were mentioned in despatches.

In July, 1944, the squadron was amalgamated with No. 882 and the Wing embarked in the escort carriers *Pursuer*, *Emperor* and *Searcher*. This force was responsible for providing fighter cover for the "Third Front" landings in the south of France and operated in the attack rôle against Toulon, Marseilles, Cannes, Avignon, and several targets in the Aegean Sea.

Amalgamation with No. 882 Squadron virtually closed this chapter of 898's history and the "Fighting '98" was not re-formed until July, 1951. Its base was Arbroath; the allotted aircraft were Hawker Sea Furies, and the commanding officer was Lt.Cdr. L. Brander, R.N.

At that time it was Admiralty policy to reduce the size of some squadrons to eight aircraft, and at this strength the unit, after a brief work-up period, joined the 17th Carrier Air Group. No. 807 (Sea Fury) and 810 (Firefly) Squadrons completed the Group, which embarked in H.M.S. *Ocean* (Capt. C. L. G. Evans, D.S.O., D.S.C., R.N.) and sailed for Malta. In the six months following the Group operated both from the deck and from R.N. Air Station Hal Far, completing 2,300 flying hours and 2,000 deck landings whilst embarked, and a further 1,300 hours from the shore base. In February, 1952, came a transfer to H.M.S. *Theseus* (Capt. C. N. Lentaigne, D.S.O., R.N.) and, subsequent to that, participation in several exercises with the NATO Fleets. In June of the same year H.M.S. *Theseus* was ordered to the Canal Zone, and there she remained for about three weeks, with her aircraft at readiness for any trouble which might have arisen from the Egyptian "situation." In August the Group was again on the move, this time back to H.M.S. *Ocean*, returning to Malta after her operational tour off Korea. At this stage 898 Squadron amalgamated with 807, and once more ceased to exist as an entity. Only a year was to elapse, however, before its second resuscitation and on August 24th, 1953, it re-formed at Brawdy, to be equipped with the new Hawker Sea Hawks.

By October 6th all twelve of the allotted aircraft were on charge, most of them having been flown in from the Holding Units at Abbotsinch and Stretton by Rochester-based ferry pilots. The last days of August and most of September were spent in converting to the 'Hawks and in familiarization flying. There followed some divisional drill (a division is a sub-formation of four aircraft), and high-speed interceptions in co-operation with the Fighter Direction School (H.M.S. *Harrier*) at Kete.

The senior pilot obliged us by explaining the work-up programme in some detail, touching first on the interception practices among the squadron pilots themselves. Flying in sections or divisions, he said, they first took turn and turn-about to act as targets or intercepters, later going on to more ambitious exercises with No. 806 Squadron. Not surprisingly, there were instances of the rival pilots "mixing it," and though this afforded valuable experience, the difficulty of identification led to confusion, so that inter-squadron interception exercises were latterly confined to a succession of passes.

Armstrong Whitworth pilots responsible for the testing and development of Sea Hawks: (left to right) F/L. J. O. Lancaster, D.F.C., S/L. P. M. R. Walton, F/L. J. G. McCowan, S/L. E. G. Franklin, D.F.C., A.F.C. (chief test pilot), and F/L. W. H. Else.

Other exercises entail the use of the G.45 camera gun and G.G.S. (gyro gun-sight) recorder, and call for various forms of attack at different speeds and heights, depending on the weather and the experience of the pilots. Then there are navigation exercises in the low-flying area. And there are plenty of QGHs (controlled descents) and GCAs—for bad weather is usually assumed, if not encountered, at the end of an exercise. Dummy deck landings by day and night, bad weather flying, instrument flying and forced-landing practice round off the programme.

One exercise, of great operational importance and demanding frequent practice, is the "snake climb," whereby in bad weather the squadron is able to ascend to high altitude in the shortest possible time and in close company. This entails taking off in pairs and beginning the ascent when the correct speed for climb is attained. Should the first section make any alteration in course the leader calls up the following sections, who make the necessary adjustments. Thus the pairs remain "in the snake" and, arriving out on top of the weather, the second pair is likely to hear the leader call "In the clear, 25,000, see you." The same system applies on the ensuing QGH let-down, and the subsequent landings are generally made at 25-30 second intervals.

Sometimes a division or a "fluid six" of Sea Hawks will fly on a "tow line" of 20 or 30 miles and a wandering section of "bouncers" will attack them unexpectedly. This affords good practice for keeping a look-out and for taking avoiding action, and for the bouncers to practise the various forms of attack.

Aerobatics are fitted in throughout the work-up and the squadron hopes to have two first-rate demonstration teams of four when the season opens.

Operational exercises of one sort or another are frequent. In "Mariner," for example, the Sea Hawks flew at low level to strike at convoys leaving Milford Haven. Then there was a Territorial exercise to try out the defences of Plymouth, when all the twelve aircraft of the squadron put in two simulated attacks at a great height; and on another occasion, with a destroyer squadron as the target, 898 flew a combat air patrol for low-level Hornets and Attackers.

The culmination of the present strenuous work-up phase will be embarkation in a new aircraft carrier about mid-year.

A "clamp" morning at Brawdy was an opportunity to hear something from a few of the junior pilots, most of whom, on joining the squadron, had about 90 jet hours in their log-books and some experience of deck-landing in Attackers. With 898 they were averaging 31 hours' flying a month, in which achievement a figure of 73 per cent aircraft serviceability was a major factor.

To report that these shrewd young officers are satisfied with their aircraft would be doing the Sea Hawk far less than justice. They are positively delighted. "Very confidence-making" was the spontaneous assessment of Lt. F. W. S. Grant, newly returned from an exchange posting with VF172, U.S. Navy (equipped with McDonnell Banshees). As a new pilot, he assured us, he was immediately comfortable in the aircraft, and on the score of performance he had special praise for the rate of climb. A ready endorsement was forthcoming from Lt. W. R. Dillen, U.S. Navy, sometime of VF52 (Grumman Panthers).

We heard it said on more than one occasion that Armstrong Whitworths couldn't be more helpful. Especially appreciated was their entirely unsolicited re-spraying of the leading edges of

the 806 Squadron Sea Hawks to ensure that these A.W. products should look really ship-shape when embarking for the first time.

Crossing to the C.O.'s office for our final interview we spotted a strange device in the form of a fish and sun (like the squadron badge), admitting 898 Squadron to "The National Federation of Fish Fryers." Appended were the signs-manual of Sam Bass, George Harry Dawson and Rudyard Kipperling.

Thus did the first Sea Hawk squadron pay fraternal tribute to the second.

With an anthracite stove and Lt.Cdr. Parker's pipe at full bore we settled down for our final interview. Records show that as an operational pilot and in the field of experimental flying the lieutenant commander has had a notable career. Flying from H.M.S. *Victorious* in August 1942, as C.O. of No. 884 Squadron (Fulmars), he shot down two Cant Z.1007s which were attempting to attack a Malta convoy, and three months later he was flying Seafire IICs in the North African operations. In September 1943 he was commanding the nine Seafires attached to No. 833 Squadron, flying cover for the Salerno landings from H.M.S. *Stalker*, and in June 1944, he formed No. 1845 Squadron at Brunswick, Maine, the unit being equipped with twenty-four Corsair IIIs (F3A-1). January of the following year saw the squadron *en route* to Australia, in H.M.S. *Slinger*, and Lt.Cdr. Parker was shore-based there until, in April 1945 he left to assume command of 1842 Squadron in H.M.S. *Formidable*. The squadron was subsequently in action against the islands around Okinawa and, prior to the dropping of the first atomic bomb, against the Japanese mainland. In April 1946, Lt.Cdr. Parker completed the first peace-time course at the School of Naval Air Warfare, St. Merryn, and in August re-formed No. 800 Squadron, equipped with twelve Seafire 17s. With "800" he remained in H.M.S. *Triumph* (Mediterranean Fleet) until March 1948, when he attended the Empire Test Pilots' School. The course there completed, he took up duties with "C" Squadron at Boscombe Down, participating in the first deck trials of the Wyvern 2, Seagull and "navalized" Supermarine 510. After 3½ years at Boscombe he did ten months "sea time" in H.M.S. *St. Austell Bay* and H.M.S. *Myngs*, and during this period flew the Falkland Island Dependencies Auster floatplane, based on Port Stanley.

Lt.Cdr. Parker had his first meeting with the Sea Hawk at Boscombe Down, and his second as a pilot of the Naval Air Fighting Development Unit. It was while serving with NAFDU that he participated in the angled-deck trials aboard U.S.S. *Antietam*, and, as reported in *Flight* of July 10th last, he made—in a Sea Hawk—the 5,000th landing on that historic vessel after she had been fitted with the new deck. He has 76 types in his log book, including 15 jets.

The Sea Hawk he describes as a simple and straightforward aeroplane. Other comments we heard at Brawdy (we transcribe our notes directly) were: "aileron control down to and below the stall . . . no wing drop at stall, and 5-6 knots stall-warning buffet . . . serviceability excellent . . . cockpit well arranged and pilot sits with legs well stretched out, as in Fury . . . all the room in the world . . . excellent view . . . no snaking or vibration with air brakes . . . steady gun platform . . . not nearly at limit of Mach number development . . . good heat control and very quiet . . ."

Likewise reassuring is a recent Admiralty disclosure that No. 804 Squadron, which formerly operated Sea Furies, is working up with Sea Hawks in Scotland, under the command of Cdr. E. M. ("Winkle") Brown, O.B.E., D.S.C., A.F.C., M.A., R.N.

COMPACT QUICK-ACTION FIRE EXTINGUISHER

IT is recognized that certain types of fire-extinguishing chemical, if used in a confined space, are toxic in their effect. The theory of accidental discharge of extinguishers in a freight compartment has been put forward in the past in connection with otherwise inexplicable crashes.

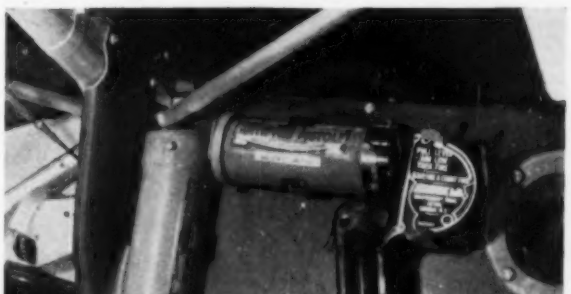
An aircraft-cabin fire-extinguisher which is claimed to be 100 per cent non-toxic (and non-injurious to instruments, fabrics, foodstuffs, etc.) is the Antifyre Aero Pistole MkIII/B, a development of the well-known Pistole extinguishers made by Antifyre, Ltd., Shaftesbury Road, London, W.3.

Granted full A.R.B. approval after aircraft-fire tests, the Aero Pistole depends for its efficiency on the discharge of the extinguishing medium from a pistol-like container. The chemical is contained in a cartridge—the renewable refill—and a trigger and firing pin detonate a percussion cap which fires a small gunpowder charge; this ejects the chemical (a dry powder) in a cloud which completely envelops the fire. The chemical—the composition of which is not disclosed—does not depend on the inert-gas principle of excluding oxygen from the seat of the fire; instead, it de-oxygenates the surrounding atmosphere. While the initial discharge has a valuable beating effect, the powder is so light and finely divided that it is at once carried upwards, to exert its effect through the full height of the flames.

Installation features of the Aero Pistole which will appeal to aircraft owners and operators are its low weight of 4 lb 7 oz (including spare charge, and mounting brackets) and its overall dimensions: including its bracket, it measures only 7½in long by 5in deep by 2½in wide; the charge occupies 6in x 2½in. Price, including mounting bracket and spare charge, is £4 5s.; refills are 6s. each—or free if they replace a charge that has been used on an accidental fire.

The Pistole is stated to be unaffected in its efficiency by lapse of time or by extremes of heat, cold, or moisture.

We recently watched an impressive demonstration of the extinguisher, conducted under convincing conditions. The interior of a large crate, open on one side and containing odd lengths of timber, was coated with liquid tar, liberally sprayed with about a quart of cellulose thinners and petrol, and ignited. When the flames were rising to some 12 or 15ft the pistol was discharged at the base of the fire from a distance of approximately 10ft. Instantly—and we use the term literally—the blaze was snuffed out.



The Antifyre extinguisher mounted in an Auster cabin.

In one subsequent test the fire broke out again, probably through ignition of residual vapour by a small flame at some distance from the main centre. A refill was snapped into the pistol in a matter of one second; fired, it extinguished the blaze for good. Other tests, including one in which a stream of petrol was run on to the fire from a ¼in pipe—a heavy demand on any type of extinguisher—were equally convincing.

The makers state that the Antifyre Pistole is primarily a "first-aid" weapon, for use before metal becomes red-hot or wood turns into glowing embers; even so, it has on occasions dealt effectively with well-established fires. Incidentally, we are informed that, by reason of the innocuous nature of the chemical, the "weapon" can be safely discharged at a person whose clothing is on fire.

DUTCH F-84 REPAIR CONTRACT

AN agreement by which Royal Netherlands Air Force F-84s will be repaired and overhauled by the Dutch firm Industriemaatschappij Avio-Diepen, N.V., was announced in Holland recently. The contract was negotiated at R.N.A.F. request between Avio-Diepen and Republic Aviation International, whose president said that he hoped this would be the first of a series of agreements by which NATO countries would themselves overhaul the F-84 Es and Gs they had received from the U.S.A. during the past two and a half years. When the swept-wing F-84F Thunderstreaks begin to arrive at the end of this year, a similar arrangement will be made.

A technical team from Republic are due to visit the Dutch firm to ascertain its requirements for special tools and test equipment. The firm will not fabricate parts as these are already obtained from existing sources, and no licence construction is involved.

A new runway suitable for jet fighters and heavy aircraft is under construction at Ypenburg, where the Avio-Diepen works are situated.

It is stated that the contract will not in any way be influenced by the merger, recently reported, of Avio-Diepen with the Fokker company.

ATTRACTING the AIRLINE PILOT

The Question of Salary

By W. M. ANDERSON

THIS, the latest contribution to the controversy on the recruitment and training of airline pilots, is by an airline captain who has been flying charter services, mostly overseas, since the war. When in the R.A.F. he flew Blenheims and Bostons on over 100 operational sorties, did about 1,500 hours as an instructor on twins and multis, and later flew for two years with Transport Command. Here he concentrates mainly on the question of higher pay as an incentive to airline recruiting. Previous articles on the subject in the past six months appeared on July 3rd (I. L. S. McNicol), October 16th (David Brice), November 6th (John Bishop) and January 8th (David Meager).

HAVING studied with interest the various views expressed in articles and letters in recent issues of *Flight* on this subject of recruiting airline pilots, I somewhat diffidently put forward my own ideas as a further basis for argument.

To go back a long way, between the wars airline pilots were mostly ex-R.F.C., or had served in the R.A.F. with short-service commissions. A few started on their own, paying their own way, which may have cost £500; today it would be nearer £6,000.

After the 1939-45 war *all* airlines were pleased to pick and choose from the large number of experienced and semi-experienced pilots coming out of the R.A.F. and, as a result, salaries were almost the same as pre-war, in spite of the fact that living costs were much higher.

Very soon the R.A.F. decided that young pilots were needed for jets, and that the undisciplined war-time rabble should be replaced by a new generation of young disciplined pilots. The results took a couple of years to appear, and the percentage of casualties were as large as during war-time training. Belatedly, the R.A.F. tried to get the experienced pilots back, though with poor results until the level of Service pay and allowances became higher than civil salaries; then many pilots returned to the R.A.F., so depleting the civil pool. An air vice-marshal of Bomber Command stated that the pilots of the new Canberra squadrons were between 27 and 37 years of age, had learned caution the hard way, and were thus safer for the flying of expensive jets.

Without starting the old argument of civil *versus* Service pilots, one may remark that it is obvious that no individual or company could afford the cost of the training and experience gained at public expense in the R.A.F. It is also indisputable that a pilot has to learn by experience; no amount of right-hand-seat time will make a captain. To quote a squadron saying: "There are some old pilots, and some bold pilots, but no old bold pilots." In Transport Command near the end of the war were some pilots who, having obtained their wings, and having done two years on secondment to B.O.A.C., came back into the R.A.F. with 1,500 to 2,000 hours' R.H. seat time. Through no fault of their own they were useless and could not be recommended for captaincy. A man must have a lot of command time to become a good captain, and the most economical place to obtain it is in the Services.

At present, an experienced pilot in the R.A.F. gets a higher salary, plus keep, etc., and is better off financially than a civil pilot; and until civil salaries are attractive enough he will stay in the Service even after a short-service commission, thus reducing the need for new recruits and training. If civil aviation offered a Service pilot (of say 28 years old, with 3,000 to 4,000 hours) a salary of £2,500 p.a., plus allowances, increasing to £5,000 p.a., there would be an incentive to take the trouble of getting civil licences. These figures are not exorbitant when American Airlines pay £4,000 to £7,000 p.a., and Sabena in the Congo have attracted captains from East Africa, South African and other airlines with guaranteed minima of £3,500 to £5,100 p.a. plus free housing and medical facilities.

All this points to the fact that British airline pilots are among the worst-paid in the world, particularly when U.K. income tax is deducted; so why should a good Service pilot leave, and enter civil aviation, to be financially worse off?

I can hear someone saying, "Where shall we get 1st officers from?" There are several answers to this, but the present-day method of employing young, inexperienced pilots of 20 to 23 years old, willing to spend about ten years in the right-hand seat as a navigator, is not the best one.

Firstly, the experienced ex-R.A.F. pilot lured by a fat salary, should, if he is the right type, have no objection to doing at least a year in the R.H. seat, but also as a captain on probation; and, being older and more experienced, he should be a better navigator than the young trainee. He will also make a good captain; but at, say, 28, the thought of ten years' R.H. seat flying at a salary of £800 to £1,180, before he gets a command at 38, is too ludicrous to contemplate.

Secondly, there will still be the few who learn the expensive way and will be available with the minimum hours and no experience.

Thirdly—and something should have been done about this a long time ago—hundreds of navigators were discarded at the end of the war, and present-day navigators in the R.A.F. have no future outside the Service. My suggestion is that they should have the benefit of any money spent by the airlines, and given training up to commercial-licence standard. Many of them, being basically pure navigators, may never want to get into the L.H. seat as a captain, and this would help solve the second-pilot problems; also, the airlines would benefit by the great deal of navigational experience already paid for by the public.

I am sure that, with the incentives of the necessary help and a good salary, there is here a great pool upon which civil aviation could draw at less expense than by the suggested training of boys. To sum up:

(1) High salaries would attract good pilots from the R.A.F. as captains after acclimatization.

(2) Decent salaries and help to obtain pilots' licences would lure good navigators to the R.H. seat.

(3) These withdrawals from the R.A.F. would mean that new recruits would have to be trained, so making it necessary, probably, to re-open some of the closed schools.

(4) This leaves the R.A.F. holding the baby; but, in turn, civil airlines can be used to augment Transport Command when required, thus saving the maintaining of duplicate fleets of large aircraft and the crews to man them.

PRESTWICK DIRECTORSHIP

CHIEF designer to Scottish Aviation, Ltd., since 1942, Mr. Robert McIntyre has been elected to the company's Board. Born in Glasgow 53 years ago, he received his education at Dunedin, New Zealand, then returned to this country to serve an apprenticeship as a naval architect with the Ayrshire Dockyard Co. at Irvine. This was in 1916, and later he went over from marine to aircraft engineering, joining Short Bros., at Rochester, on the design side. He was there for three years, then went to Hawkers, where in 1925 he was in charge of the experimental design office. He remained with the Kingston firm for 17 years, during which period he was associated with the design of such famous types as the Hurricane and Typhoon. In 1942 he returned to his native Scotland as chief designer to Scottish Aviation, whose Prestwick Pioneers are now in service with the R.A.F. in Malaya, and whose 16-passenger Twin Pioneer is scheduled to appear at Farnborough this year.

Mr. McIntyre.

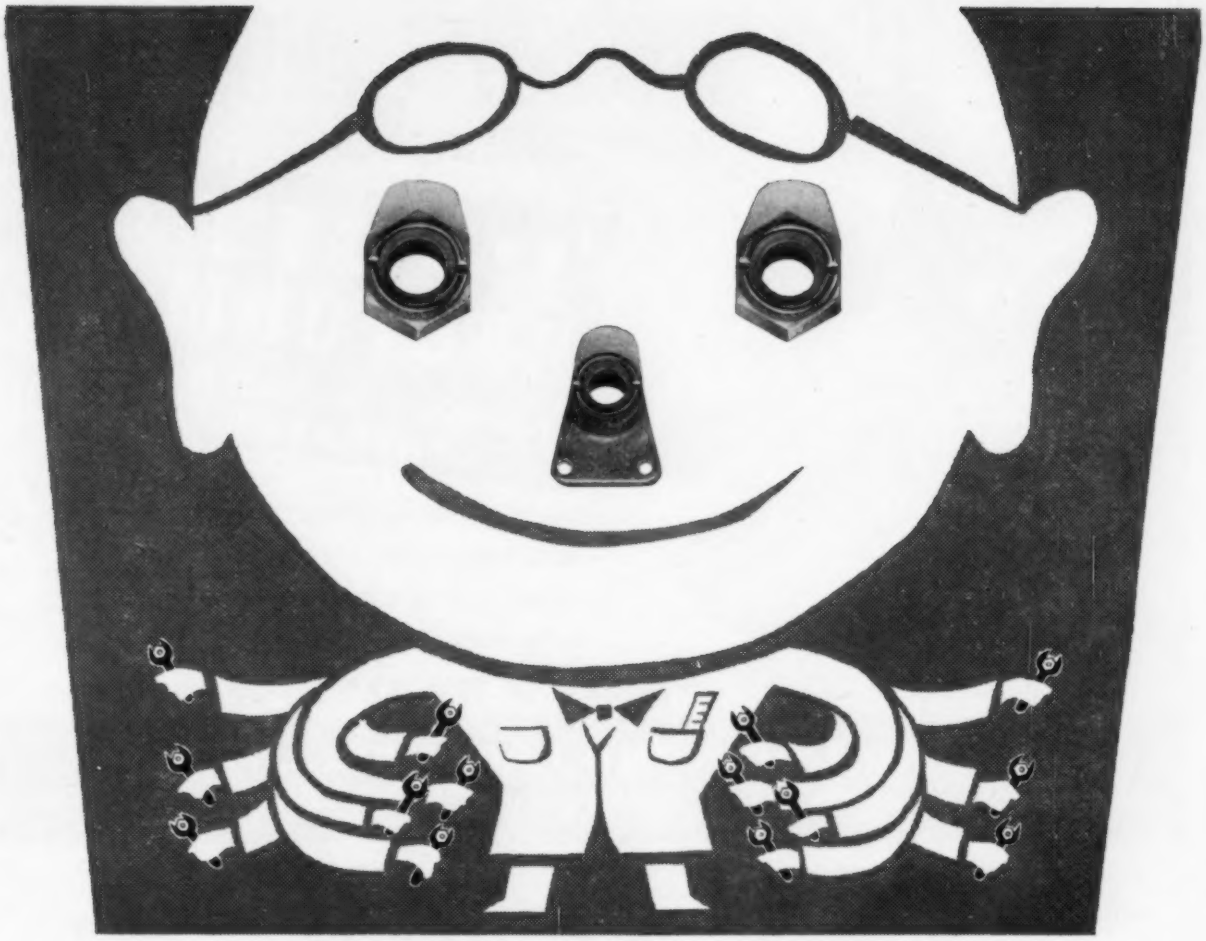
UPLANDS AND ROCKCLIFFE EXPANSION

CANADA'S Defence Department has spent about $20,000,000 on new construction work in its programme of expansion and development of the Government-owned airports of Uplands and Rockcliffe in Ottawa. This vast programme will place the two fields among the forefront of any in North America.

Payments on contracts at both places in the fiscal year 1952-3 alone came to around $5,000,000. At Uplands, up to last March, contracts for over $10,500,000 had been placed, whilst at Rockcliffe the figure was over $5,500,000. Further contracts have been placed more recently.

At Uplands these contracts included a large cantilever hangar and workshops, construction of hard-surfaced runways and 214 housing units. The hangar and workshops are to cost $3,773,371; the runways $2,649,000 and the 214 housing units, for Air Force personnel, $1,880,656. Development seems unlikely to stop here; the intention is to continue to expand facilities, with a new administration building and waiting rooms. The idea, apparently, is that Uplands should become not only an alternative trans-atlantic landing-ground for Dorval Airport, Montreal, but also a leading military and defence-research airfield.

Rockcliffe is not being extended in size, but the facilities have been improved a great deal in the last year or two. There the largest contract was one of more than $2,000,000 for the construction of 300 housing units for R.C.A.F. families; another was of $1,797,000 for an Air Material Command building.



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The Sopwith Pup

LIKE Mr. J. M. Bruce (in his letter in *Flight* of February 5th, 1954) I also was much intrigued by the "S.L. T.B.P." designation of the Sopwith Runabout given by Mr. J. W. R. Taylor in his letter in your issue of January 22nd.

About fifteen years ago I spent some time trying to identify and arrange chronologically all the Sopwith designs of which I could find any record. Although I have unfortunately not noted all my sources of information, I see from my files that I conjectured at that time over the possibility of the Sopwith designs having been known—at least in the Kingston design-office—by a series of identification letters, the type letter being the last of a group of four or five letters which comprised the complete designation. The other letters in the group may have served to identify the configuration of the design.

My files record three type-designations for Sopwith designs which suggested this possibility in conjunction with the fact that the types concerned appeared to fall chronologically roughly into their right alphabetical positions. Mr. Taylor's designations for the Runabout appears to fit this theory also.

The evidence known to me for an alphabetical series of Sopwith design designations is now, therefore, as follows:

Type Designation	Possible Interpretation of Designation	Aircraft Name or Description
D3	Type D Mark 3	1914 tandem two-seater biplane (100-h.p. Gnôme Mono)
S PG N	Seaplane pusher gunbus Type N	Gunbus floatplane
SL TB P	Sopwith landplane tractor biplane Type P	Hawker's Runabout
L RT TR	Landplane reconnaissance triplane Type T (Revised)	"Egg-box" triplane

I wonder if any former member of the Sopwith Company has any recollection of these designations or whether there is any record of them in the archives of Hawker Aircraft, Ltd.

Towards the end of 1916 the Sopwith Company seems to have started a new series of designations for its designs which appears to have continued until the Company was wound up after the war. This new series, of which several of the designations have been published, may have succeeded the earlier series after Type Z had been reached. It seems quite possible that the Sopwith Company may have produced about 26 separate *basic* design-projects (excluding variants) by about the end of 1916.

Some of the Sopwith type-designations in the later series are well known but I append a table of those which I have identified:

Type Designation	Possible Interpretation of Designation	Aircraft Name or Description
F.1	(First) fighter single-seater	Camel
2 F.1	Second fighter single-seater	Naval Camel
5 F.1	Fifth fighter single-seater	Dolphin
7 F.1	Seventh fighter single-seater	Snipe
8 F.1	Eighth fighter single-seater	Snail
B.1	(First) bomber single-seater	Single-seater bomber
T.1	(First) torpedo single-seater	Cuckoo
FS.1	(First) fighter seaplane single-seater	Single-seater fighter seaplane
2 FR.2	Second fighter reconnaissance two-seater	Bulldog
2 B.2	Second bomber two-seater	Rhino
3 F.2	Third fighter two-seater	Hippo
TF.1	(First) trench fighter single-seater	Salamander
TF.2	(First) trench fighter two-seater	Buffalo
3 C.2	Third commercial two-seater	Wallaby
STI.2	Sopwith (first) touring/instruction two-seater	Dove

It is interesting that this second series of Sopwith design designations is similar to the naming code later adopted by the United States Navy, which is still in use.

I should like to compliment *Flight* on the enlightened attitude it has taken in recent years to encourage the study of aviation history. I should also like to express my appreciation of the help you have given those interested in historical research into the evolution of aircraft design. Mr. Bruce's articles in particular, have been outstanding contributions to the recorded history of British aviation.

Ruislip, Middlesex. PETER BROOKS.

[Mr. P. W. Brooks, B.Sc. (Eng.), A.C.G.I., A.F.R.Ae.S., is personal assistant to Mr. Peter Masefield, B.E.A.'s chief executive, and acts as his personal pilot at times when Mr. Masefield is not flying the aircraft himself.—Ed.]

Short Answer

WITH reference to the letter from "Two-ringer" published in *Flight* dated January 29th last, I would suggest that no man, not even an Auxiliary, could be so altruistic and self-sacrificing in the defence of his supposedly unworthy fellows as he suggests. I can't help feeling that secretly, of course, he enjoys flying Meteors and that the same applies to him as to the air vice-marshal who had lots of rings . . .

London, W.1. FECKLESS MORTAL.

Claim to Fame

YOUR "Fifty Years" issue of December 11th, 1953, brought back very many memories, but I searched the pages in vain for a reference to an aircraft which I feel deserved to appear.

This is the Junkers Junior, which was an all-metal low-wing cantilever monoplane, equipped with a Genet Major engine and having a cruising speed of 100 m.p.h. and range of 650 miles. Designed and built about 1928 or 1929, it was years ahead of its time and was, I believe, unique in that it earned two separate "mentions" in one issue of *Flight*, as you will see from pages 320 and 322 of your issue of September 23rd, 1937.

Aircraft of this type were also the first used by the South-West African Airways, the company which subsequently developed into South African Airways.

The pilot of the aircraft mentioned in *Flight* in 1937 seeks no personal publicity, but wishes to ensure a place in history for an outstanding machine.

Johannesburg Light Plane Club. ZS-ACK.

[Certainly the Junkers Junior was a noteworthy light aircraft; but, like a number of others, it had to be excluded through limitations of space, even though our historical review extended to 34 pages and included no fewer than 271 photographs. The more significant Junkers F.13 of 1919 was illustrated.—Ed.]

IN BRIEF

Mr. Parthenon Jones, F.Z.S. (51, Kenworthy Road, London, E.9) is compiling a biography of the pioneer parachute-designer Robert Cocking, who met his death in 1837. He seeks the assistance of readers who can supply him with any letters, photographs or woodcuts concerning the inventor or his work.

FORTHCOMING EVENTS

Feb. 19. Institute of Transport (Berks, Bucks and Oxon Section): "Airline Engineering," by R. C. Morgan, O.B.E.
Feb. 20. British Interplanetary Society (North-west Branch): "Building the Lunar Base," by R. A. Smith.
Feb. 23. Institute of Transport (Essex Group): "Air Transport," by F. J. Parke, Assoc.Inst.T.
Feb. 23. R.Ae.C.: Film Show.
Feb. 24. R.Ae.C.: Dinner to speed and height record holders.
Feb. 24. R.Ae.S. Graduates' and Students' Section: "Aircraft Plastics," by Lorne Welch.
Feb. 25. Aerodrome Owners' Association: Annual general meeting and dinner.
Feb. 26. Institute of Transport: Annual dinner.
Feb. 26. Northern Heights Model Flying Club: Annual dinner and dance.
Feb. 27. British Interplanetary Society (Provisional Western Branch): "Provisioning of Interplanetary Vehicles," by G. L. Garthwaite.
Mar. 1. Royal Society of Arts Lecture: "Safety in the Air," by A. Cdre. Sir Vernon Brown, C.B., O.B.E.
Mar. 2. R.Ae.S.: Section Lecture: "Metal Sandwich Construction," by F. Tyson, B.A., A.F.R.Ae.S.
Mar. 4. R.Ae.S. Main Lecture: First Barnwell Memorial Lecture, by Major G. P. Bulman, C.B.E., B.Sc., F.R.Ae.S. (at Bristol).
Mar. 5. Helicopter Association: "The Design of the Drive," by J. L. Norton.
Mar. 5. Avro 504 Club: 3rd annual dinner, Londonderry House.
Mar. 5. Photogrammetric Society: "Soil Survey" lectures by Dr. Alex Muir and J. Callow.
Mar. 10. R.Ae.S.: 7th Louis Bleriot Lecture (in Paris): "The Domain of the Helicopter," by R. Hafner, A.F.R.Ae.S.

R.Ae.S. Branch Fixtures (to March 26).—Feb. 23, *Belfast*, "Engineering Aspects of the Flutter Problem," by N. P. Shevloff. Feb. 24, *Weybridge*, "Shape of Wings to Come," by D. Keith-Lucas. Feb. 25, *I.O.W.*, "Accident Investigation," by A. Cdre. Sir Vernon Brown. Feb. 26, *Birmingham*, "Development of the Vickers Viscount," by A. Greenwood.

Mar. 1. *Halton*, film show. Mar. 3, *Luton*, "Shape of Wings to Come," by D. Keith-Lucas.

Mar. 9, *Belfast*, "Guided Weapons," by M. B. Morgan. Mar. 17, *Manchester*, "Sandwich Construction Applied to Aircraft Structure," by W. G. Heath. Mar. 23, *Belfast*, "Aspects of Resistance Strain-Gauging," by G. A. Lewis. Mar. 24, *Bristol*, Joint Meeting with Inst. Prod. Engineers: Lecturer, Walter C. Puckey; *Luton*, annual general meeting and presidential address. Mar. 26, *Birmingham*, "Delta Aircraft."

THE INDUSTRY

Ground-starting by Rectifier

FOR many years past, small transportable metal-rectifier/transformer sets fed from A.C. mains have been used to provide D.C. current for the testing of aircraft services during routine maintenance in hangars. Recent developments have now made it possible to employ rectifiers for engine starting also, not only on small aircraft, but for the larger types as well, including turbojets and turboprops.

A claim made for rectifier starting-equipment is that it can continue to fulfil its secondary rôle of supplying servicing current whilst an aircraft is being refuelled; with a prime-mover type of power unit this practice is not permissible unless the unit is at least 50ft down-wind of the refuelling-point.

Starting and servicing requirements of the larger types of aircraft, including turbojets such as the Comet, have been carefully studied in the design of the new Westruk Type 960 equipment developed by the Westinghouse Brake and Signal Co., Ltd. (82 York Way, Kings Cross, London, N.1) in collaboration with the M.C.A. One of the *desiderata* is the limitation of the D.C. open-circuit voltage to about 28.5 while maintaining a D.C. voltage high enough to provide suitable starting power for engines that may initially take a peak current of up to 2,000 amp.

The Westruk Type 960, the design of which is completely weatherproof, is arranged for manual operation and mounted on four 8in × 2in rubber-tyred wheels. Overall dimensions are: length, 4ft 10½in, height 3ft 7in, width 2ft 8in. The components include a double-wound, three-phase mains transformer (complying with B.S.S. 171), an arrangement of three-phase full-wave rectifier elements, and an instrument panel with voltmeter and ammeter and stop-and-start push-buttons. The circuit is arranged to operate in conjunction with a main contactor on the A.C. mains side, control being effected through the third pin of the now-accepted international standard plug and socket, so that it is impossible for the aircraft connection to be broken while under load. Special attention has been given to the question of quick stowage of the D.C. cable after the aircraft engines have been started.

If required, provision can be made for a parallel-fed D.C. supply to aircraft which do not utilize the standard plug and socket; in such cases, dummy stowages in the rectifier truck provide an interlocking circuit to ensure that only one D.C. cable can be alive at any one time.

A further feature is the provision of an overload-protection device which ensures that the ground power given by the rectifier to the aircraft does not exceed the 500-amp continuous current rating of the rectifier. This feature is particularly necessary in connection with such aircraft as the Stratocruiser, which can otherwise draw currents much in excess of the rectifier continuous rating. The overload relay is arranged to operate if the current taken continuously reaches 550 amp. An over-riding control button ensures that the supply is not interrupted during the starting operations.

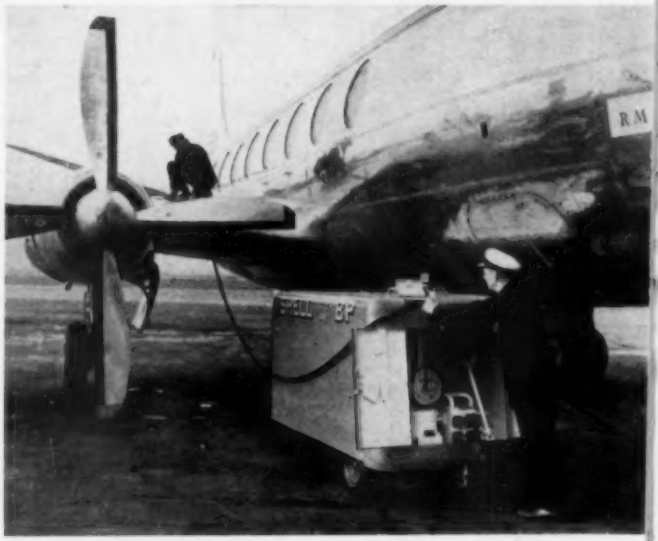
Similar equipment for larger D.C. power supplies, and also for 112-volt D.C. installations in some of the newer aircraft, are at present being designed.

Westruk Type 960 equipment, showing control panel.

Aircraft Fluids on the Spot

AMONG the range of airfield ground equipment manufactured by Zwicky, Ltd., of Slough, is a trolley designed, in its various forms, to cover such aircraft requirements as oil-system flushing or replenishment, the supply of de-icing fluid, water/methanol or fresh water, and sanitary servicing. Arranged for towing by a tractor, the trolley is mounted on four 16in by 4in heavy-duty pneumatic tyres, and carries a tank and pumping equipment.

Generally the tanks are of 100-gallon capacity and, in the case



A Zwicky trolley waits upon B.E.A. Viscount "Sir Ernest Shackleton."

of the oil-flushing trolley, the compartment at the rear contains two Zwicky totally enclosed reciprocating pumps (4in bore by 3in stroke), one to draw clean flushing fluid from the storage tank, and the other to draw dirty liquid from the aircraft oil system, delivering it to a disposal tank. The pumps are actuated by a Villiers petrol engine through worm gearing and a chain drive. The delivery pump is fitted with an adjustable relief valve.

Water/methanol, coolant or de-icing fluid are stored in a brass tank with filling, dipping and draining connections. For these purposes, a Zwicky hand pump (3in bore by 3in stroke) is fitted, with a three-valve manifold taking the suction and delivery pipes from the pump. All fluid is drawn through a gauze-screen filter before passing through the pump and is afterwards passed through a Kent meter. The 20ft-long ¾in delivery hose is mounted on a self-winding reel and carries a trigger-operated nozzle.

IN BRIEF

A number of Coolair Minor portable air-cooling plants have been supplied at the special request of the Royal Australian Air Force and are being used to cool the aircraft in which the Queen and the Duke of Edinburgh are travelling during their visit to the Commonwealth. These valuable items of ground equipment are made by M.L. Aviation Co., Ltd., of White Waltham Aerodrome, Berkshire.

* * *

A grant of £2,000 a year for the next seven years is being made to Birmingham University by the Dunlop Rubber Co., Ltd., partly for general purposes but mainly to establish a Dunlop Fellowship for research work on the chemistry of high polymers, including natural and synthetic rubbers; provision for technical assistance; and the purchase of apparatus not normally available.

* * *

Etablissements Cellolac, French associate company of Cellon, Ltd., Kingston-on-Thames, have been granted a premier award for their aircraft finishes, which are based on Cellon formulæ. The award was made in connection with the *Concours des Produits d'Aviation*, which is sponsored by the French Government and divided into a number of sections for various classes of equipment and materials having aeronautical applications.

Fleet Air Arm "Sea Hawks"

OFF *to a perfect start . . .*

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Plessey **TSC 50**

TURBINE STARTERS

Photograph above shows a simultaneous pilot-operated start by five "Sea Hawks". The smoke plumes are the exhausts of the Plessey TSC 50 Cartridge starters.

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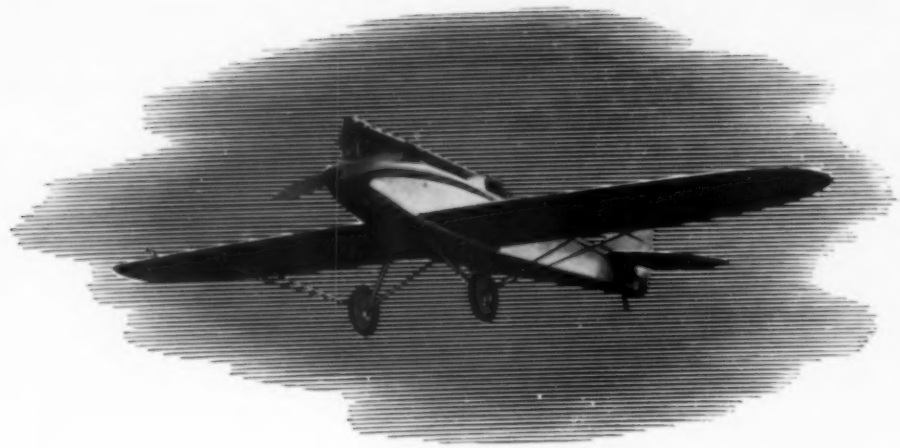
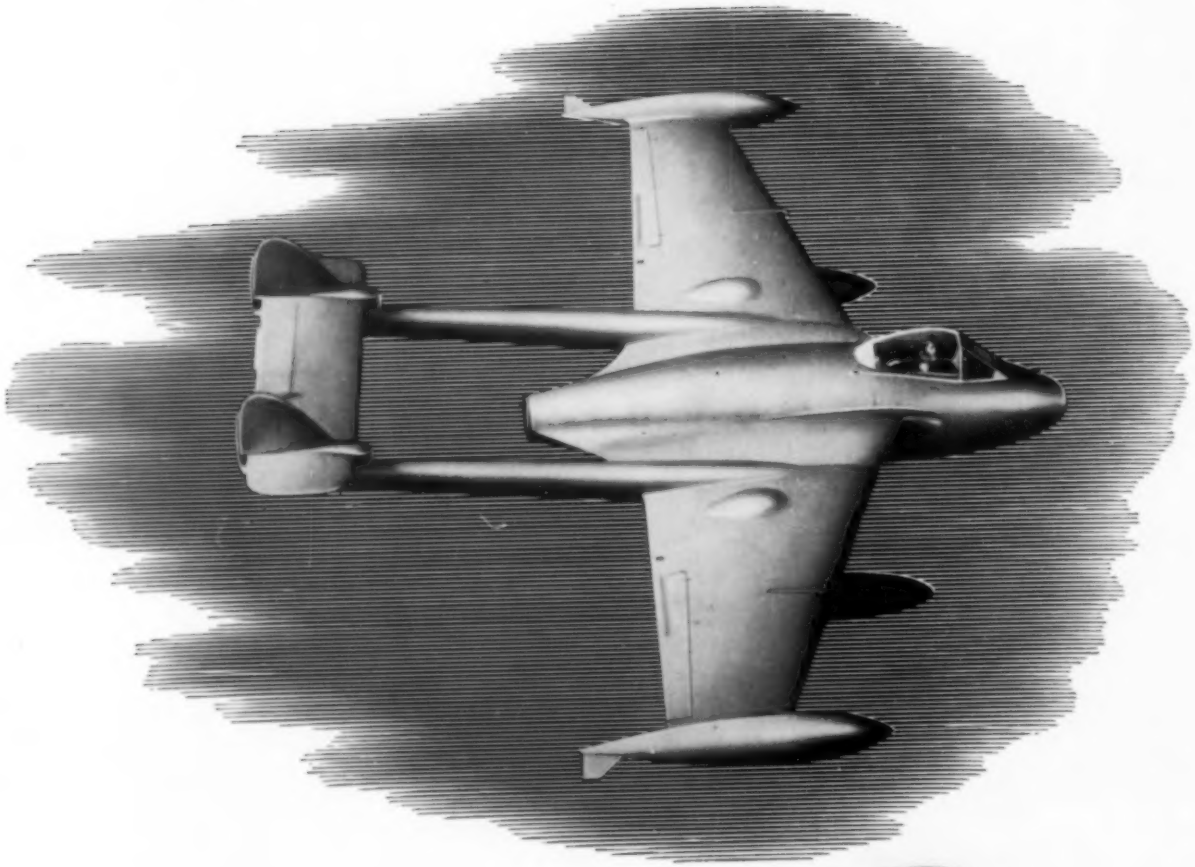


Then and now



DE HAVILLAND approve

Castrol
MOTOR OIL

IN GREEN AND SILVER, but without the fashionable white top, Viscount EI-AFV "St. Patrick" is the first of four ordered by Aer Lingus. Accommodating 48 passengers each, they will shortly enter service on the Irish airline's routes from Dublin to London, Manchester, Amsterdam and Paris. A Viscount order from India is reported below.

CIVIL AVIATION

INDIA ORDERS VISCOUNTS

ALTHOUGH formal confirmation was not available at the time of going to press, it appears certain that Vickers-Armstrongs have won the long "sales battle" waged in India against Convair. A report from New Delhi last Saturday stated that a £2m order would shortly be signed for six Viscounts, for service with the nationalized Indian Airlines Corporation. This contract would bring the number of Viscounts firmly ordered to 94, including 53 for overseas airlines. Other Viscount contracts are under negotiation, and at least one more overseas order is likely to be announced in the near future.

TUDOR TO HAMBURG

AFTER the granting of an unrestricted C. of A. to modified Tudor 1 and Tudor 4B aircraft (reported in last week's issue), the first passenger proving-flight took place on Sunday last. The operating company was Air Charter, Ltd., and the flight, from Stansted to Hamburg, was made in G-AGRG, a Mk 1 machine.

This aircraft is the first to be modified for passenger-carrying by Aviation Traders, Ltd., and is fitted with 42 seats, all but four of which are rearward-facing. Maximum all-up weight of the type is 80,000 lb; on the flight to Hamburg, made with 24 passengers, the take-off weight was 72,000 lb. The crew comprised Capt. E. N. Jennings (the company's chief pilot), Capt. J. N. Carreras, Nav/Off. H. Wolter, Rad/Off. R. W. Williams, Eng/Off. B. W. Blunden, and Stewardesses Daphne Ayscough and Hillary Coleman.

A cruising speed of 180 kt T.A.S. was maintained but, due to a holding period overhead at Hamburg, the time for the trip amounted to 2 hr 54 min. The return flight was made the following day; 26 passengers were carried (at a take-off weight of 78,300 lb), and the time taken was 2 hr 38 min.

The certification of the Tudor in the full public transport category is the direct result of the efforts of Mr. F. A. Laker, managing director of Air Charter, Ltd., over the past few years. The modifications approved by the A.R.B. for the type include the removal of the pressurization, the re-positioning of electrical and radio equipment and the addition of an extra emergency exit. The fleet of ten Tudors which are being thus modified will be operated from Stansted, the company's main base. There is in addition a permanent Air Charter unit at Hamburg which operates two Yorks and two Bristol Freighters on freighting flights along the Berlin corridor.

STORM OVER THE ATLANTIC

A FULL debate on the question of North Atlantic air freight services seems the probable outcome of a spirited interlude at question time in the House of Commons on February 10th, when the Minister of Transport and Civil Aviation, Mr. Alan Lennox-Boyd, was called upon to account for recent developments in that field. It is hoped that Mr. Lennox-Boyd—who has professed himself ready and willing for such a debate—will in fact be given an early opportunity to allay some of the fears and suspicions which have been raised in the House.

Much of the questioning already mentioned was of a political nature—some displaying a curious ignorance of the application procedure—but a few points were raised to which reference must be made.

For instance, there was the matter of five Britannia freighters thought to have been ordered by B.O.A.C. Mr. Lennox-Boyd said that when the Corporation applied to him, in February 1953, for permission to buy them, he made it plain that his consent was given on the basis that they realized that they had a commercial use in mind for the aircraft, and that all applications for new freight routes would have to go to A.T.A.C.

In a later exchange, he said B.O.A.C. had agreed to hold off freight applications for one year until last July, since when they had been as free as anybody else. They had not since applied, although their intention to do so had been announced in a Press statement [presumably that published exclusively in *Flight*] last February. In view of Mr. Lennox-Boyd's firm assurance that as from July 1953 no persuasion had been exercised on B.O.A.C. with regard to their proposed North Atlantic freight application, it is difficult to understand why no application has yet been made.

The Minister revealed that he had had a number of consultations with Sir Miles Thomas and the chairman of Airwork in regard to the latter's all-freight service on the North Atlantic route. Both had told him that they would consider the possibilities of co-operation in the national interest in the development of their respective North Atlantic services, which would be complementary rather than competitive. In reply to Mr. Frank Beswick (Lab., Uxbridge) he said that he knew of no proposed agreement between them which embodied new principles on which the House should be informed.

The subject cropped up again at question time on February 15th, when Mr. Lennox-Boyd said that B.O.A.C. had not placed a firm order for five Britannia freighters; the only order was for 25 passenger versions.

THE ELBA SEARCH

ON Friday last the frigate *Wakeful*, from which a search is being made for the main wreckage of the Comet that crashed in the sea off Elba on January 10th, made her first major "find." Manœuvring his vessel over a position at which trawlers had reported contacting heavy objects with their sweeps at a depth of about 400ft, Cdr. Morrow arranged for the lowering of an underwater television camera, and for several hours the experts on board were able to study four major portions of wreckage. Numerous photographs of the television screen were taken and, after processing, passed to Mr. Bertram Morris (M.C.A.) and Mr. Peter Detmold (de Havillands) for identification. At the time of writing it is believed that this wreckage consisted of the major parts of the wing and its centre-section.

It is reported that the sighting was made on a new Pye underwater television camera that had been flown out during the previous week. A camera of this make was already in use by the Admiralty when it was learned that there was a new Pye project for equipment designed to operate at 3,000ft. The equipment was scarcely beyond the drawing-board stage, but on receipt of an urgent Admiralty request the firm built a prototype within a week, and two of their engineers flew it out to Piombino, on the Italian coast, for collection by the destroyer *Wakeful*.

Several other companies have also made valuable contributions to the operation. Marconi's were early on the scene with a television camera; it was flown out by one of their technicians, with another from Siebe, Gorman, who made the pressure-casing for the camera. Ekco television monitoring equipment was also used.

Much of the initial search for wreckage was conducted by means of echo-sounding, a technique in which many advances have taken place in recent years. Admiralty-pattern sounding equipment, of the type developed by Kelvin and Hughes, Ltd., was employed.

Last Monday, further major wreckage—believed to be the rear fuselage and tail—was seen on the television screens; later, rough seas hampered attempts to bring to the surface what was believed to be the nose section.

LINKING PAST AND PRESENT: Capt. René Cadier, shown in the cockpit of an Air France Viscount, was two months old when M. Lucien Bossoutrot (right-hand seat) flew the first French passenger service on February 8th, 1919. The aircraft (right) was this 8/15-seat Farman Goliath, one of the largest of the early bombers converted to transport aircraft.

CIVIL AVIATION . . .

FRENCH AIR TRANSPORT ANNIVERSARY

THE air route between London and Paris is important not only as a link between two of the world's greatest cities but also as the corridor in which the very first airline services were operated. For nearly 35 years it has seen intensive competition between British and French civil operators, although the first passenger service was in fact flown by the R.A.F.—in December 1918.

In that month, a communications flight was formed to take members of the British Government to Paris for the Peace Conference. Altogether this unit made 749 flights to Paris, carrying 934 passengers (among them Sir Winston Churchill) and 1,008 bags of mail. Scheduled civil passenger services were started on August 25th, 1919, by Britain's first airline—Aircraft Transport and Travel, Ltd. A few weeks earlier, on July 14th, the company had made its first charter flight between the two cities.

French operations began on February 8th, 1919, with a journey from Toussus-le-Noble to Kenley by a Farman Goliath, an event recalled on Monday of last week when Air France celebrated "the 35th anniversary of international commercial aviation."

The Goliath, powered by two 260 h.p. Salmson engines, was designed, built and produced by Henri Farman, and was bought from him by the French Government shortly before the flight. Contemporary accounts of this historic visit to London give slightly varying estimates of the journey time and of the number of passengers aboard. *Flight* recorded on February 13th, 1919, that the Goliath "left Toussus-le-Noble at 11.15 a.m. . . . and arrived at Kenley aerodrome, near Croydon, at 2.30 p.m. It was piloted by Lieut. Bossoutrot and among the thirteen military passengers on board was Sgt. M. Chevillard, who was well known at Hendon in pre-war days."

BRITAIN'S DELEGATE on the I.C.A.O. Council since 1947, Sir Frederick Tymms, is shortly returning to England. With Sir Frederick (right) at his last council meeting in Montreal is seen Mr. J. E. Keel, his successor.

One of the passengers was a representative of the French journal *L'Aèrophile*, who was most impressed by the quality of accommodation provided in the Goliath: "No more mufflers, no more fur-lined flying clothing, or paper underclothing. Some of us were only wearing our uniform tunics without greatcoats. One can talk easily in the cabin, much better than in an ordinary aeroplane; that is to say, that the noise of the engines is not too deafening. As for the port-holes, they are placed in such a manner that visibility is perfect."

The organizers of the flight seem to have anticipated practically every amenity enjoyed by air travellers today. Passengers were provided with a "small overnight bag" for the night-stop in London and with refreshments consisting of "a hamper of provisions for lunch" and "the first glasses of champagne ever to be swilled in an aerial bus above the Channel."

Air France, whose DC-4s and Viscounts are expected to carry over 100,000 people between Paris and London this year, celebrated the 35th anniversary of the Goliath flight by flying a number of distinguished passengers over the route in one of their new British turboprop airliners. The aircraft, F-BGNP, was actually the sixth to be delivered. M. Farman, now 72, was at Orly to wish it *bon voyage* but did not feel well enough to travel himself.

Among those on board was the Goliath pilot, Lucien Bossoutrot, who, at 64, now has to his credit 12,000 flying hours in 188 types of aircraft. He took a spell at the controls of the Viscount and declared himself greatly impressed with its handling qualities. Other passengers included M. Ziegler, the director-general of Air France, and M. Auburtin, vice-president of the Municipal Council of Paris, bringing a message of greeting to the Lord Mayor of London, Sir Noël Bowater. M. Auburtin was greeted at London Airport by the Lord Mayor's First Esquire and Swordbearer, Mr. W. T. Boston, who joined the Viscount for the return journey to convey a reciprocal message from Sir Noël.

This atmosphere of Anglo-French co-operation was enhanced by the presentation—by Mr. R. P. H. Yapp, director of Vickers-Armstrongs, Ltd.—to M. Bossoutrot of a beautifully finished model Viscount.

Although the London-Orly stage-length of 227 miles is rather short for the Viscount, the type is used by Air France on two of their seven round trips daily between these airports. The main reason is, of course, its strong passenger-appeal, which is strengthened by the gastronomic attractions of the celebrated "Epicurian" cuisine. We personally sampled this combination by boarding F-BGNP for the return flight to Paris.

Timetables allow the Viscount 1 hr 25 min for the journey: it sets off from L.A.P. each day at 1.30 p.m. and, passing from one time-zone to another, is due to touch down at Orly at 3.55 p.m. Cruising over the weather at 15,000ft, F-BGNP got us there in 55 min—11 min over the Epicurean record.

The French landscape was bleached with snow, and there was a thick layer of tyre-grooved slush on the Orly runway. Although Capt. Cadier's touch-down was feather-light the Viscount sent up a cloud of crystals as it landed. Some of the snow was melted as it passed through the Dart-efflux to emerge between flaps and wings, adding to the effect of alighting on water.

As on the "aerial bus" of 35 years ago, champagne was served aboard our Viscount as it crossed the unseen Channel. The excellent chicken lunch would perhaps have been even better had there been a little more time in which to relish it; but this is a small price to pay for the smooth swiftness of the Viscount.

Like B.E.A.'s Type 701s, the French 708s accommodate 47

GLASGOW'S NEW TERMINAL: Buffet (left) and ticket desk in the attractive new B.E.A. terminal at St. Enoch Square, Glasgow, recently opened by the Lord Provost, Mr. T. Kerr. Renfrew, domestic airport for Glasgow, handled 210,000 passengers last year—34 per cent more than in 1952.

passengers in rows of five abreast. The interior differs in several respects, notably in the layout of the freight bay in the rear fuselage and in the *décor*—russet seats and a sand-coloured roof. Floor and side-screening are of a plastic material which has a pleasing rich-brown colour but a texture which is utilitarian rather than luxurious.

By rights this story should end with some sober reflections on the advances which air transport has made since, 35 years ago, the old Goliath played its notable part in blazing the air trail between Paris and London. But history had the last laugh: the Farman returned to Paris on February 9th, 1919, but on February 9th, 1954, we were unable to fly back to London. The weather was bad at L.A.P., and the next service was not due out until the following morning. Faced with reports of a strike by French meteorologists at Orly and Le Bourget we made an almost heretical decision—to return by rail and sea.

COMMEMORATING ATLANTIC PIONEERS

THE London Airport memorial to Sir John Alcock and Sir Arthur Whitten-Brown, which William McMillan, R.A., has nearly completed, is to be erected temporarily in the Bath Road terminal area, at a point where it will easily be seen by passengers disembarking from incoming services. Later, when the new terminal area in the centre of the airport is brought fully into use, the statue will be erected permanently in front of the public entrance to the eastern apex building.

NEW SERVICES APPROVED

THE Minister of Transport and Civil Aviation has given his conditional approval to the operation of an internal service between Newcastle (Woolsington) and Belfast (Nutts Corner) *via* an optional stop at Glasgow (Renfrew) by Hunting-Clan Air Transport, Ltd., until March 31st, 1960. No traffic is to be carried between Glasgow and Belfast except in agreement with British European Airways.

The following applications for amendments to air services have also been approved:

(a) The inclusion of Manchester (Ringway) until March 31st, 1961, as either a terminal or an intermediate traffic stop on B.O.A.C.'s normal scheduled services between the United Kingdom and Boston and/or New York and between the United Kingdom and Bermuda or Nassau. [Sabena opened a weekly tourist service from Ringway to New York on October 28th, and added a weekly first-class flight on December 26th.]

(b) An increase of frequency on the services operated by B.K.S. Air Transport, Ltd., between West Hartlepool (Greatham) and London (Northolt) up to a maximum of 12 return flights weekly.

(c) The extension to Nottingham (Tollerton) of the Internal Services operated by Derby Aviation, Ltd., between Derby and/or Wolverhampton and Jersey. (The use of Nottingham is subject to adequate facilities being made available at that aerodrome.)

BREVITIES

COMPLETE and up-to-date information on G.C.A. procedures at civil aerodromes in the United Kingdom is provided by *Civil Aviation Information Circular* No. 14/1954. Six airports are equipped with the system—L.A.P., Northolt, Ringway, Prestwick, Nutts Corner and Hurn.

* * *

Since January 18th, Sabena have been using S-55 helicopters on their regular daily postal service in place of the three Bell 47s which began this work on August 21st, 1950. The Bells, which have now been sold, flew the daily circuit of 270 miles nearly 1,000 times, carrying a total of 166 tons of mail.

* * *

T.W.A. were due to inaugurate a weekly all-freight DC-4 service between London and New York on Tuesday. For some time the airline has operated two DC-4 cargo services weekly between New York and Paris *via* Gander and Shannon. To increase cargo capacity on their inter-European Constellation flights, T.W.A. also make use of six Speedpak panniers, each capable of holding nearly 3 tons.

* * *

Examinations for the recently established Aerodrome Controller's Certificate of Competency will be held in London on May 3rd and September 6th this year, and on January 3rd, 1955. Applications should be made on form C.A. 1080, which can be obtained from the following address: Ministry of Transport and Civil Aviation, ATLI(b), Berkeley Square House, London, W.1.

* * *

Procedures to be followed by civil operators making use of the G.C.A. unit of the U.S.A.F. at Blackbushe are outlined in *Civil Aviation Information Circular* No. 15/1954. Use of this approach aid is subject to the completion by the operator of the customary "hold harmless" agreement, which absolves the U.S.A.F. authorities from liability in the event of an accident.

The first Japanese post-war international air service was inaugurated on February 2nd, when Japan Air Lines' DC-6B *City of Tokyo* took off from the capital for San Francisco, carrying 18 passengers. The Tokyo-Okinawa service was opened three days later.

* * *

Unofficial airline records on 13 Australian inter-city routes have been established by the five Convair 240s operated by T.A.A. Since their introduction to service in 1948 the Australian State airline's Convairs have carried over 1 million passengers and have completed more than 30,000 trips.

* * *

The M.T.C.A. has adopted the recently framed I.A.T.A. regulations concerning the carriage of "restricted articles" as a basis for permitting civil operators to carry dangerous goods in aircraft flying to or from the United Kingdom. The subject is discussed in *Civil Aviation Information Circular* No. 13/1954.

* * *

It is reported that three senior pilots of B.C.P.A. have left that company to take over executive posts with Pakistan International Airlines. They are: Capt. M. Guthrie, who will be chief pilot; Capt. M. Hemsworth, operations manager; and Capt. C. Polley, senior routes captain. After conversion training at Burbank they will ferry P.I.A.'s new Super Constellations to Karachi.

* * *

K.L.M. and S.A.S. are protesting against a recent decision by the South African Department of Transport reducing by 50 per cent the number of services flown to Johannesburg by the two companies. This restriction is due to come into effect on July 1st. As a further measure of protection for S.A.A., the Department has also ruled that at least one half of the capacity provided between Europe and Johannesburg by foreign airlines must be for first-class passengers.

CIVIL AVIATION . . .

CLUB AND GLIDING NEWS

FOUR of the seven pilots who "attacked" Denham on Sunday succeeded in evading the strong defences put up by the Vintage Aeroplane Club. To do so they had to avoid interception by a defensive force of no fewer than eight aircraft—three Austers, two Magisters, Hornet Moth AMZO, Leopard Moth AIYS and Aeronca AEVS.

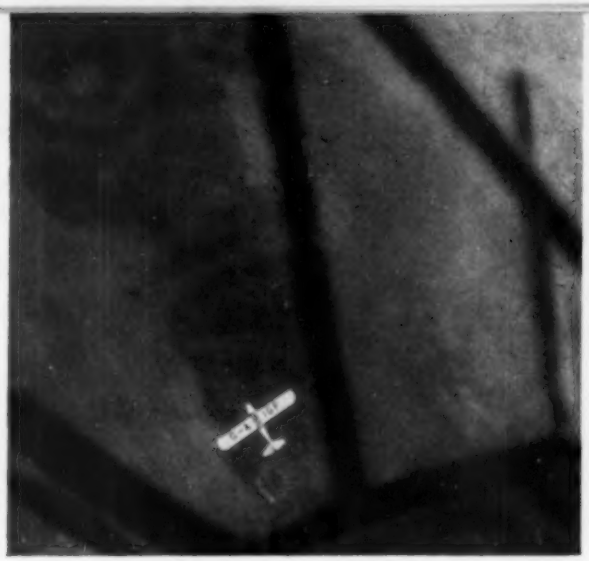
However, defenders had not merely to identify but to obtain a recognizable photograph of their quarry. Subsequent inspection of the films taken showed only one really successful interception: P. A. Denne's picture of an Autocrat, whose clearly visible registration letters proved it to be that flown from Rochester by Maj. B. P. W. Clapin (winner of the distance prize). Two specks on film were identified, by a process of elimination, as Tiger Moth AMCM and Auster AIPG, and it was decided—although not unanimously—to count these as "kills."

Winner of the arrival competition was H. M. Woodhams, of Coventry (son of the managing director of Sir W. G. Armstrong Whitworth Aircraft), who brought his hooded Tiger Moth (G-AIZF) from a temporary base at Elstree. Both visiting and defending pilots were issued with flour-bag bombs with which to attack an impressive-looking battleship which, "moored" near the club-house, was destined to be demolished by a glancing blow from the wing-tip of a White Waltham Gemini. Woodhams and M. J. Dible (Aeronca 100) achieved mean errors of respectively 19 yd and 20 yd, and Beverley Snook (Hornet Moth) did well in the balloon-bursting contest.

To stage a flying meeting in mid-winter shows complete disregard for the British climate. As it turned out, Sunday's successful event saw nothing worse than grey skies and a threat of mist—whereas the Vintage Club's 1953 summer programme was wrecked by bad weather. Perhaps this likeable band of enthusiasts will receive better luck in 1954; Sunday was a good start.

THIRTY-SIX Private Pilots' Licences were obtained at the Fair Oaks Aero Club during 1953. Total hours flown during the year amounted to 2,090, and in the first month of this year, 102.

PERSISTENT bad weather during December and January caused a reduction in the number of hours flown by members of the Strathtay Aero Club and A.T.C. scholarship cadets at Strathtay, but did not prevent the club's new Messenger being collected and put into service. January flying hours totalled 72½.



Most successful photographic interception at the Vintage club's Denham patrol was made by P. A. Denne from Taylorcraft Plus D G-AHAI piloted by Douglas Bell. The victim: Major Clapin's Autocrat.

THE objects of OSTIV (*Organisation Scientifique et Technique Internationale du Vol à Voile*) are to encourage and co-ordinate the science and technology of soaring flight and the development and use of the sailplane in pure and applied research. The organization's fifth biennial congress is to be held in Buxton, Derbyshire, from July 21st to August 5th, i.e., at the same time as the World Gliding Championships at Great Hucklow, and only twelve miles away. It may be recalled that the last congress was held in Madrid in 1952.

The programme of this year's OSTIV congress is as follows:

(1) Applied Aerodynamics (boundary layer investigations on low-drag aerofoils; stability and control; tail-less gliders; investigations of performance and handling qualities of sailplanes; and optimum-performance soaring flight techniques).

(2) Design of sailplanes (design of two-seaters, high-altitude and tail-less types; auxiliary engines and assisted take-off methods).

(3) Structural progress and maintenance (aeroelastic problems; monobloque and monocoque structures).

(4) International airworthiness requirements for gliders and sailplanes.

(5) Standardization of instruments, accessories and equipment for gliders.

(6) Training methods.

In addition to the above technical agenda, the meteorological programme (not yet finalized) will include the discussion of stationary waves and pressure jump lines, jet streams, convection, long-range forecasting, electrical phenomena, and soaring birds. Further details may be obtained from the OSTIV Secretary at 3, Kanaalweg, The Hague, Holland.

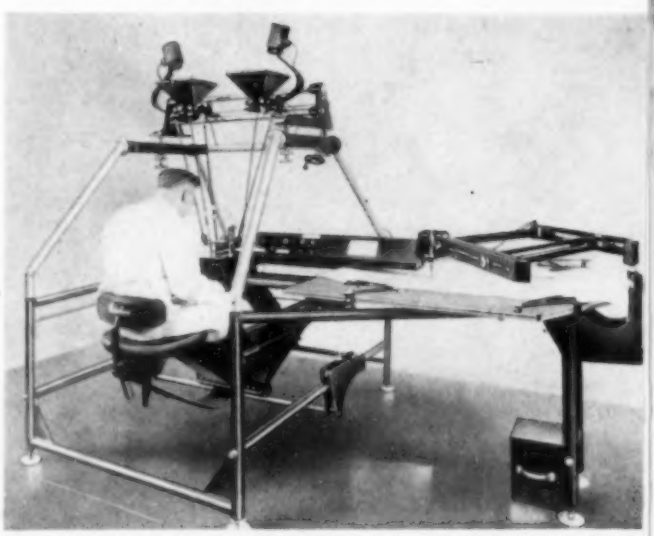
NEW WILLIAMSON PLOTTER

A NEW air-survey plotter was the subject of a paper read before the Photogrammetric Society on Monday last, by Mr. J. E. Odle, joint managing director of the Williamson Manufacturing Co., Ltd., the well known aerial camera and air survey instrument makers.

This new plotter known as the Type L.S.P., is based on Mr. Odle's own ideas, and is intended for use with the Williamson Multiplex, enabling the user, by employing a heavy pantograph, to accommodate a much wider range of mapping scales. An important advantage is that the precision attained is approximately twice that of the Multiplex working alone. This increased accuracy can be employed either to give enhanced precision for the same flight altitude or, by flying higher, quartering the number of photographs required to cover the same ground area. This latter advantage is of great economic value where good but not finely detailed maps are required of large areas. The economy lies not only on the photographic side but also in much reduced flying costs.

The instrument provides a new British solution, filling the gap between the Multiplex and the more costly first order machine, by providing a flexible low-cost unit for compilation of maps, the initial air triangulation being achieved by Multiplex, by first-order instruments, or by analytical bridging.

Comfort of the operator has been closely studied. While tracing the map, he moves inside the stereoscopic-model area. The stereoscopic model is seen at five times the photograph scale, but the resulting map can be completed at any scale down to 1/10th of the viewing scale. Handwheels are used for the X and Y co-ordinate motions—a feature usually found only on more elaborate machines—increasing tracing precision. Practical air tests have been made with encouraging results.



Prototype of the Williamson L.S.P. plotter, showing the operator in his moving chair. The pantograph is on the right.

He'll be in Salisbury (Rhodesia) in two days

Of the many Smiths instruments, one he may not have come across is the Maximum Safe A.S.I. This is specially designed for high speed aircraft to indicate the safety factor existing at any speed or altitude. It gives simultaneously a reading of the indicated airspeed and the maximum safe airspeed permitted. To facilitate reading during approach and landing the scale is 'opened' at the lower ranges.

He will shortly be boarding an R.A.F. transport 'plane to take up a new posting, perhaps as an instructor on training aircraft. If he *is* air-crew, he knows how much the safety of his flight to Africa (and of all the other hours he has logged) depends on Smiths instruments.

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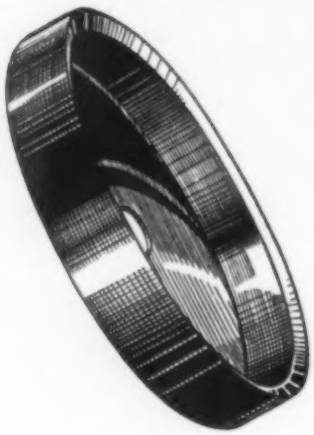

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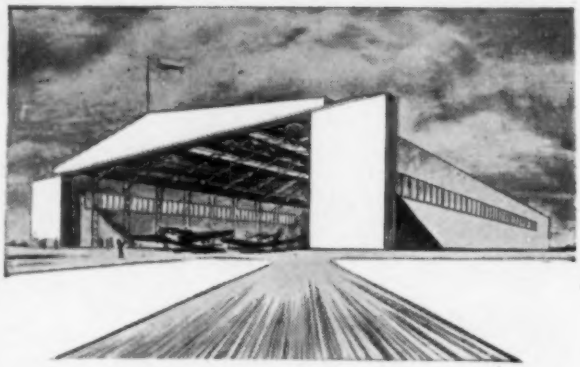

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SERVICE AVIATION

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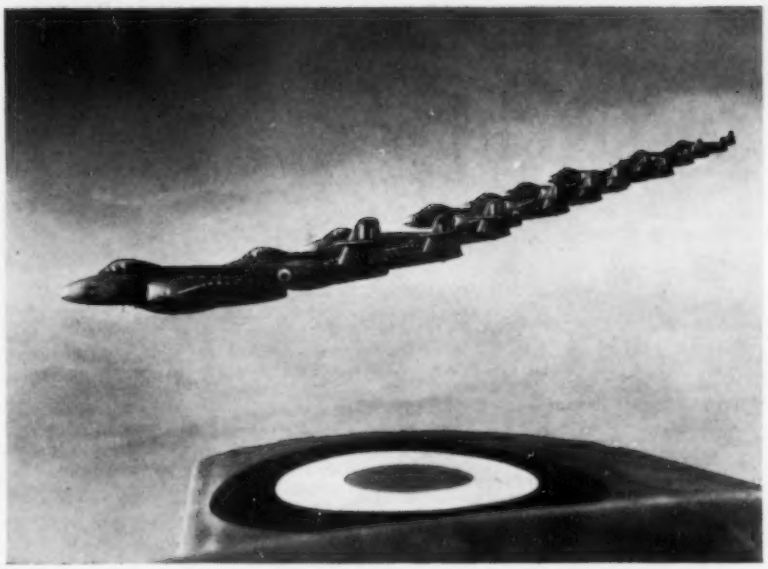

A GOOD DOZEN: Twelve Meteor 8s of No. 63 Squadron, led by S/L. F. W. Doherty, flying in "echelon starboard, stepped up" over Cambridgeshire. In addition to those painted on the fuselage, squadron markings appear on the wing-tips.

High Command Appointments

THE Queen has been pleased to approve the following appointments: Air Marshal Sir Donald Hardman, K.C.B., O.B.E., D.F.C., to be Air Member for Supply and Organisation; Air Marshal C. E. N. Guest, K.B.E., C.B., C.B.E., to be Inspector-General of the R.A.F.; A.V-M. G. R. Beamish, C.B., C.B.E., to be A.O.C-in-C. Transport Command.

Sir Donald Hardman succeeds Air Chief Marshal Sir John Whitworth Jones, K.C.B., C.B.E., who is retiring. He has recently returned from Australia, where for the past two years he has been Chief of the Air Staff to the R.A.A.F. Before going to Australia Sir Donald was A.O.C-in-C. Home Command.

Air Marshal Guest, in his new post as Inspector-General, will succeed Air Marshal S. C. Strafford, C.B., C.B.E., D.F.C., who, also, is retiring from the Service. Air Marshal Guest has been A.O.C-in-C. Transport Command since May 1952 and before that date was at the Air Ministry as Assistant Chief of the Air Staff (Operations).

A.V-M. Beamish, who takes over Transport Command, has for the past two years been Director-General of Personnel (II) at the Air Ministry, and was formerly A.O.C. Iraq. He entered the Service as a cadet at R.A.F. College Cranwell, in 1923 and commanded the College in 1949.

The two officers who are retiring both have very long service to their credit. Sir John Whitworth Jones served in the Royal Engineers (T.A.) from 1912 until he was commissioned in the Royal Flying Corps in 1917, transferring to the R.A.F. on its formation on April 1st, 1918. As a squadron commander he specialized in army co-operation work but much of his later service has dealt with operations and organization. Air Marshal Strafford was commissioned in the Royal Naval Air Service in 1917 changing, of course, to the R.A.F. when it was formed a year later. He won his D.F.C. while serving with No. 224 Squadron in the 1914-18 war. The last two posts which he held before becoming Inspector-General were as Commandant-General of the R.A.F. Regiment and S.A.S.O. at Bomber Command.

The First Swift Squadron

SPECULATION as to which unit would be the first to receive Supermarine Swifts is now ended—No. 56 Squadron, commanded by S/L. C. J. Storey, is to have that honour.

No. 56 has quite a remarkable record in both wars. It was formed at Gosport in June 1916, from a nucleus provided by No. 28 (Home Defence) Squadron. Despite its comparatively late start the squadron was credited in the 1914-18 war with the destruction of 395 enemy aircraft and six balloons. Its pilots were remarkable exponents of the S.E.5. Capt. Albert Ball and Capt. J. B. McCudden both won the Victoria Cross while serving with the unit.

In the 1939-45 war No. 56 first had Spitfires and, later, Tempests. It served in France, at Dunkirk, in the Battle of Britain and on the Continent and was credited with destroying 149 enemy aircraft.

No. 26 Squadron Ceremony

ON the 20th of this month a ceremony is due to take place at R.A.F. Oldenburg, Germany, at which Commandant A. J. Mossop, C.B.E., representing the South African Air Force, will present a mounted springbok head to No. 26 Squadron, R.A.F. It will be received by S/L. K. Smith, D.F.C., the C.O.

The relationship between South Africa and No. 26 dates back as far as November 1914, when a unit of the South African Aviation Corps was formed for service in South West Africa. This unit, in October 1915, became embodied in No. 26 (South African) Squadron, R.F.C., and during most of the 1914-18 war continued to serve in South Africa. It returned to Britain in July 1918.

During the stay abroad the springbok's head was adopted as the squadron's insignia, and later incorporated in the official badge, with the motto in Afrikaans "N' Wafter in Die Lug" (The Watcher in the Sky).

For many years the squadron's rôle was that of army co-operation but it is now equipped with Sabres and operates as a fighter/interceptor unit.

HAWK-EYED: Bearded Lt. Cdr. P. C. S. ("Pat") Chilton, R.N., commanding No. 806 Squadron, Fleet Air Arm, keeps an eye on his Sea Hawk as it is struck down after flying aboard H.M.S. "Eagle" with other aircraft of the squadron. No. 806 had previously been working up at Brawdy, Pembrokeshire, as No. 898 are doing at present (see article "Sea Hawks" in this issue).

R.A.F.A. Raise Funds

TO raise funds for the welfare of ex-Service personnel undergoing treatment for tuberculosis in Switzerland, two gala Balls and a film première were organized by the Royal Air Forces Association at Davos and St. Moritz earlier this month. Both functions were attended by the British ambassador, Sir Lionel Lambe.

A party of well-known people, including Lord and Lady Tedder, S/L. Neville Duke, Lt-Cdr. Michael Lithgow and S/L. Leslie Colquhoun, together with the dance section of the R.A.F. Central Band, flew by Silver City Airways from Blackbushe to Zurich.

SERVICE AVIATION . . .

T FOR TETRAZZINI: The Avro Lancaster seems to be making as many final appearances as did the famous prima donna. Recently Bomber Command said farewell to the type: and here the last Coastal Command Lancaster is seen leaving Malta on its way to Britain.

From Zurich the party travelled to Davos for the first dance and the next morning visited some of the sanatoria where the ex-Servicemen are undergoing treatment.

At St. Moritz some 600 people attended the dinner and dance, at which a much appreciated cabaret entertainment was contributed by Miss Marie Burke, Miss Cicely Courtneidge, Mr. Thorley Walters and Mr. Walter Ellis, all of whom gave their services free.

Before the return to England a visit was paid to the famous Cresta Run, where the three test pilots made a descent of this famous run, which has an average gradient of approximately 1 in 3.

CF-100 Appreciation

ON giving up command of No. 3 All-Weather Operational Training Unit, Royal Canadian Air Force, at North Bay, Ontario, W/C. E. D. Crew, D.S.O. and Bar, D.F.C. and Bar, R.A.F., had some appreciative remarks to make about the Avro Canada CF-100. He said it was second to none for the job it had to do, then continued: "I've logged 170 hours on the CF-100 and, believe me, I hope I shall be flying it back home. It has no vices that I know of. It is easy to fly and extremely stable."

As a mark of appreciation from Avro Canada, Mr. M. D. Willer, assistant manager, sales and service, presented W/C. Crew with a silver cigarette box.

W/C. Crew, whose war-time score was 12 enemy aircraft and 21 flying bombs, is returning to Britain and has been succeeded by W/C. J. R. D. Braham, D.S.O., D.F.C., A.F.C.

W.R.A.F. FASHIONS: The new uniforms referred to on this page ("W.R.A.F. Re-styled"). Left to right: S/O. Mary Haslett; L.A/C. W. Rene Morton, and Sgt. Audrey Jackson.

Squadron Standard for No. 605

AWARDED in recognition of 25 years' service—completed on April 1st, 1953—No. 605 (County of Warwick) Squadron, R.Aux.A.F., is to receive its Squadron Standard on Thursday, March 11th. It will be presented by Princess Margaret, who is expected to spend about two hours with the unit at its base at Honiley, near Kenilworth.

The battle honours selected to appear on the Standard are: Dunkirk - Battle of Britain 1940 - Malta 1941 - Eastern Waters 1942 - Fortress Europe 1942/45 - Home Defence 1944 - France and Germany 1944/45. These honours indicate how varied were the duties of the unit and how widely dispersed were the areas in which it fought. At Dunkirk and in the Battle of Britain No. 605 flew Hurricanes. Later, most of the squadron was captured by the Japanese in the Dutch East Indies. Re-equipped in 1942 with Bostons and Mosquitoes, it served with 2nd T.A.F. on intruder and night interdiction work.

A. Cdre. J. A. C. Wright, A.F.C., one of the squadron's early commanding officers, is now the Honorary Air Commodore. S/L. P. M. R. Walton is the present C.O.

No. 47 Squadron Presentation

TO mark the long association between No. 47 Squadron and the Anglo-Egyptian Sudan—1925 to 1942—an informal ceremony recently took place at Khartoum, at which Sir Robert Howe, Governor General of the Sudan, handed to the unit a piece of silver presented by the people of Sudan and received a framed reproduction of the squadron's badge from the commanding officer, S/L. E. W. Merriman, M.B.E., D.F.M.

In 1925 three de Havilland 9As of No. 47, commanded by the late Air Marshal Sir Arthur Coningham, made the pioneer flight from Egypt, through the Sudan, to Kano (Nigeria), receiving an unforgettable welcome from many thousands of people who had never before seen an aeroplane. In 1927 the squadron moved from Egypt to Khartoum (a detachment having been based there previously) and went on to make many other important long-distance flights, including one to Gambia and four to the Cape.

When Italy entered the war in 1940, No. 47 Squadron was equipped with Wellesley bombers, and played an important part in the East African victory. Towards the end of the campaign it was the only operational unit remaining in East Africa, some of its Wellesleys being modified to carry eight machine guns.

In 1942 the squadron returned to Egypt, re-equipped with Bristol Beaufort and, later, Beaufighter aircraft, and was employed on anti-shipping operations. In 1944 it moved to the Far Eastern theatre for transport support duties.

After the war No. 47 was transferred to Transport Command, and in 1948 was the first squadron to receive Hastings aircraft. In November of that year it joined the Berlin air lift.

The squadron's association with the Sudan is symbolized in its badge, which includes a demoiselle crane (a bird found in the Sudan and Russia) and its motto, "The name of the Nile is an o ien of our strength."

W.R.A.F. Re-styled

NEW uniforms for the Women's Royal Air Force were displayed at the Air Ministry last week, and supplies for airwomen are expected to be available during next year; officers will be shortly able to order the new designs from their own tailors.

Designed by Victor Stiebel, a member of the Incorporated Society of London Fashion Designers, the uniform consists of a fitted, unbelted jacket with rounded corners and two pockets which are below the waist. The shoulders of the jacket are softer than previously and the skirt is cut in six panels and slightly flared. By the same designer is a new tropical dress which will be worn for the first time when the Queen visits Aden in April. This comprises a one-piece biscuit-coloured cotton tussore dress and will replace the present khaki skirts and poplin shirts.

Members of the other Women's Services will envy the W.R.A.F., who may wear plain black court shoes with this uniform on or off duty; ceremonial occasions are excepted, when the present flat lace-up shoes will be worn. These higher-heeled and more becoming shoes will (we are assured) enhance the appearance of the uniform, which is unquestionably attractive and conforms more closely to present-day fashions.

R.Aux.A.F. Officers' Ball

THIS year's R.Aux.A.F. Officers' Ball is to be held at the Savoy Hotel on April 9th, at 8.30 p.m. Music will be by Carroll Gibbons' Blue Room Orchestra. Organization is in the hands of a committee of which F/L. R. G. Shillingford (No. 615 Squadron) is chairman. Enquiries should be made to the secretary, F/O. P. F. Johnson, 225 Latymer Court, London, W.6.

Reunion

A REUNION of past and present members of No. 264 Squadron, R.A.F., is to be held in London on April 10th. Particulars from the Commanding Officer, No. 264 Squadron, R.A.F. Linton-on-Ouse, York.

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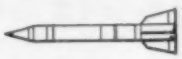
Significant of the value of this service is the fact that AVICA assemblies are installed on all the leading types of gas turbine power plants and air frames (both civil and military); *on test beds, test rigs* *and research equipment throughout the industry; and in the rocket*  *and guided-weapon field.*

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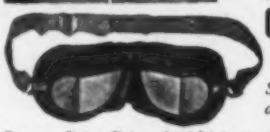

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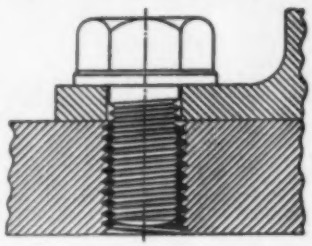

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PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned application from Airlines (Jersey), Ltd., of 4 The Parade, St. Helier, Jersey, Channel Islands, for permission to operate between May 1 and September 30, 1954, Dakota aircraft in addition to D.H.89A and D.H. Heron aircraft on all their internal and normal scheduled services (Applications Nos. 40, 41, 42 and 186) which have been approved by the Minister of Transport and Civil Aviation.
THE Council also give notice that the withdrawal of Application No. 241 from Olley Air Service, Ltd., for a U.K. internal service between London (Croydon) and Birmingham (Castle Bromwich) for the period of the British Industries Fair, 1954, which was advertised in "The Times," "The Aeroplane" and "Flight" on January 22, 1954, has now been cancelled.
THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9 Buckingham Gate, London S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [1660

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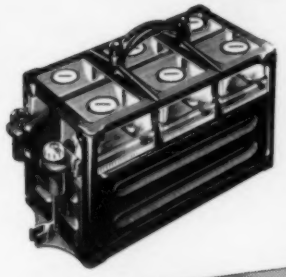

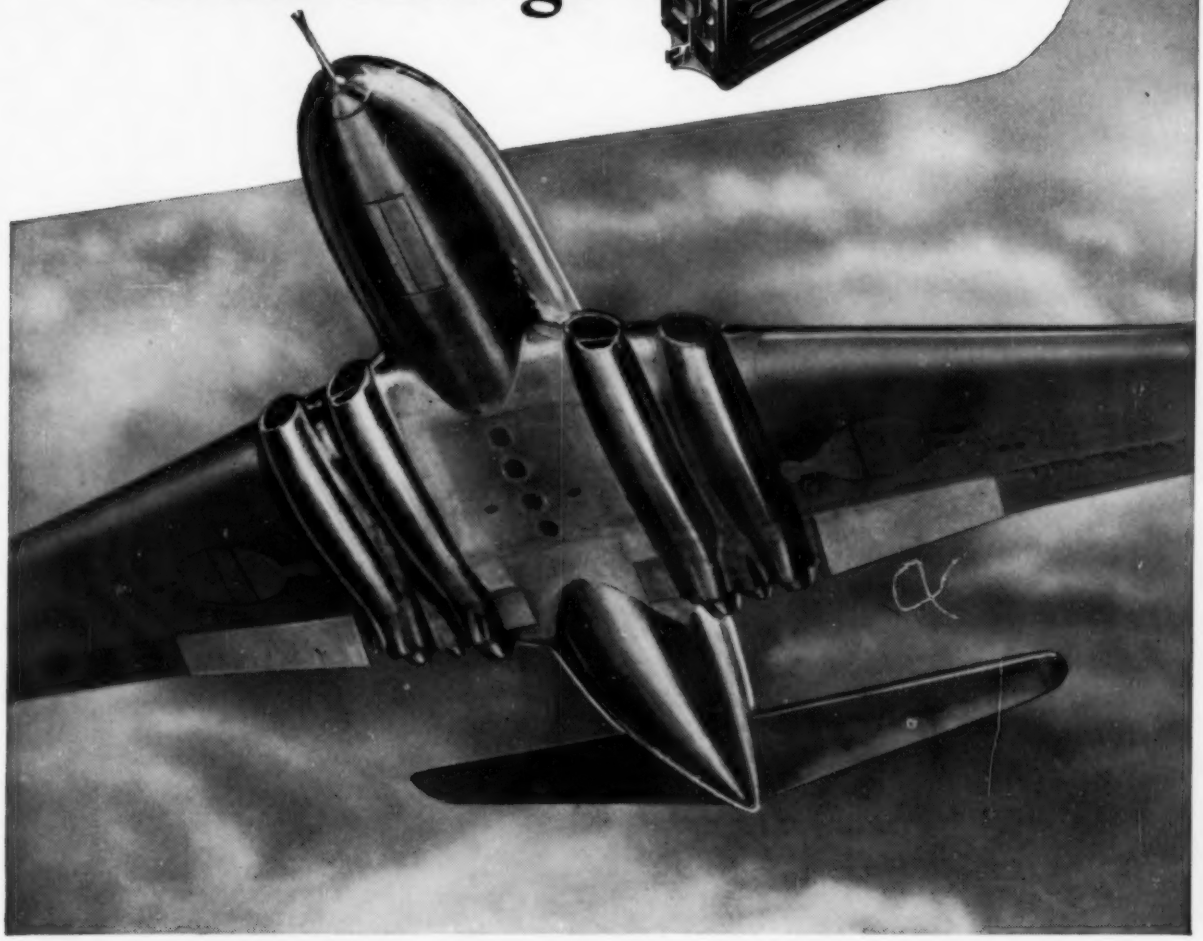

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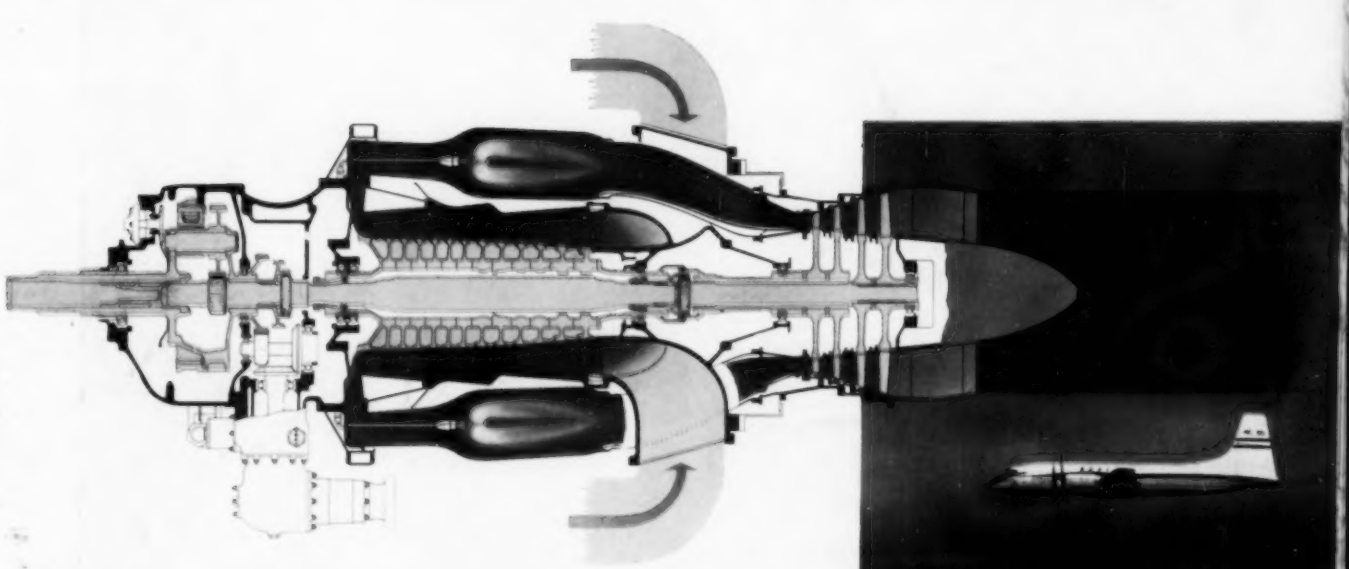

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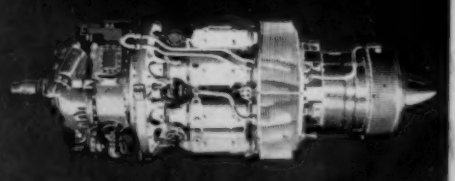

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